

City of Winchester, VA

Public Utilities Department



Standards Manual

2005

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Standards Manual

Table of Contents

I. Plan Preparation Standards

A. General.....	I-1
B. Scale	I-1
C. Orientation	I-2
D. Plan and Profile Drawings: Sanitary Sewers, Waterlines, Storm Sewers	I-2
E. Detail Sheets	I-3
F. Pump Station Drawings	I-3

II. Water Distribution Systems

A. General	II-1
B. Engineer's Report	II-2
C. Flow Requirements.....	II-2
1. Residential.....	II-2
2. Nonresidential	II-2
D. Fire Flow Test.....	II-3
E. System Design.....	II-3
1. General.....	II-3
2. Location.....	II-3
3. Size	II-5
4. Bedding and Backfill	II-5
5. Depth.....	II-6
6. Valves.....	II-6
7. Air Release.....	II-6
8. Road, Railroad or Stream Crossings.....	II-7
9. Fire Protection Requirements.....	II-7
10. Cross Connection Control	II-7
F. Materials.....	II-8
1. General.....	II-8
2. Water Mains	II-8
3. Pipe Fittings.....	II-8
4. Valves.....	II-8
5. Tapping Sleeves and Valves	II-10
6. Fire Hydrants.....	II-10
7. Water Services	II-11
G. Cleaning, Testing and Disinfection	II-13
1. General.....	II-13
2. Pressure and Leakage Test	II-13
3. Disinfection	II-14

III. Sanitary Sewer Collection Systems

A. General	III-1
B. Engineer's Report	III-2
C. Flow Requirements	III-2
1. Residential	III-2
2. Nonresidential	III-2
3. Peak Flow - laterals and sub-main sewers	III-2
4. Peak Flow - Main, trunk and interceptor sewers	III-2
D. System Design	III-3
1. General	III-3
2. Location	III-3
3. Size	III-5
4. Bedding and Backfill	III-5
5. Depth	III-6
6. Pipe Slope	III-6
7. Manholes	III-6
8. Road, Railroad and Stream Crossings	III-7
9. Sewage Pump Stations and Force Mains	III-7
E. Materials	III-8
1. General	III-8
2. Gravity Mains	III-8
3. Force Mains	III-8
4. Lateral Piping	III-8
5. Pipe Fittings	III-9
6. Valves - Force Main System	III-9
7. Manholes	III-10
8. Manhole Frame and Cover	III-10
F. Inspections and Testing	III-11
1. General	III-11
2. Gravity Sewer Lines	III-11
3. Manholes - Vacuum Method	III-12
4. Force Mains - Exfiltration Method	III-13
5. Force Mains – Air Testing	III-13
6. Pump Station Wet Wells	III-14

IV. Utility As-Built Drawings

A. General	IV-1
B. Drawing Preparation Guidelines	IV-1
C. Drawing Submittal Guidelines	IV-1
D. Digital Drawing Submittal Guidelines	IV-1
E. Water As-Built Drawing Requirements	IV-2
F. Sanitary Sewer As-Built Drawing Requirements	IV-3
G. Storm Sewer As-Built Drawing Requirements	IV-4

V. Project Acceptance of Work

Public Improvements

A. Substantial Completion	V-1
B. Final Acceptance	V-1
C. Warranty	V-2

Additional Conditions

A. Issuance of Land Disturbance Permits	V-2
B. Release of Water Meters	V-2
C. Issuance of Certificate of Occupancy	V-3

APPENDIX A – DIGITAL DRAWING CONTROL POINTS

APPENDIX B – FACILITY INSPECTION CHECKLIST

VI. Standard Details

Water:

Typical Residential Water Service - 5/8"x3/4"	WD-1
Typical Residential Water Service - Twin Setting 5/8"x3/4"	WD-2
Typical 1-inch Water Service.....	WD-3
1-1/2" & 2" Meter Installation.....	WD-4
Typical Compound Meter Service - Installation and Vault Detail	WD-5
Typical Single Jet Meter Service - Installation and Vault Detail	WD-6
Fire Line Service Installation	WD-7
Fire Hydrant Installation	WD-8
Typical Valve and Box Installation.....	WD-9
Typical Stream Restoration	WD-10
Ductile Iron Pipe Restraint.....	WD-11
Concrete Thrust Blocking	WD-12

Sanitary Sewer:

Standard Precast Concrete Manhole	SS-1
Drop Connection	SS-2
Standard Sanitary Lateral Connection	SS-3
Standard Sanitary Lateral Connection	SS-4
28-inch Manhole with PVC Ring.....	SS-5
28-inch Watertight Manhole	SS-6

Water and Sanitary Sewer:

Standard Bedding Detail - Outside Traffic Areas (PVC or DIP)	WS-1
Standard Bedding Detail - Within Traffic Areas (PVC or DIP)	WS-2

I. Plan Preparation Standards

A. General

1. All projects shall have a title sheet that will include:
 - a. A site location map detailing the project.
 - b. An index to drawings.
 - c. Name, address and telephone number of developer.
2. The design of all utility systems and extensions or modifications thereto shall be performed under the direction of a registered professional engineer with a current registration in the Commonwealth of Virginia in accordance with Title 54.1, Chapter 3 of the Code of Virginia, 1950, as amended. Where applicable, design may be performed under the direction of a certified land surveyor in accordance with Sec. 54.1-408 of the above-cited code.
3. All plan and profile sheets are to be certified by a professional engineer or land surveyor registered in the Commonwealth of Virginia, as applicable and dated.
4. Elevations are to be USGS datum.
5. All sheets are to be numbered, with the total number of sheets included. For example, Sheet 4 of 12.
6. An overall utility layout sheet shall be included and shall show streets, lots, sanitary, storm, and water line locations. Include any phasing of the development.
7. All existing and proposed storm sewer lines, gas, telephone, power and other utility lines, which cross or run parallel to the sewer or water lines, shall be shown with exact horizontal and vertical separations given, where applicable.
8. Profiles of water, sanitary and storm sewer lines are required.
9. A bench mark is required on the site plan.
10. Detail Sheet(s)/Specification Sheet(s) shall be included.
11. Plan submittal sheets shall be 24-inch x 36-inch.
12. Standard topographical, utility and boundary line symbols shall be used in the preparation of plans.

B. Scale

The following scales for drawings are required, though certain circumstances may dictate the use of larger or smaller scales:

1. Storm sewer, sanitary sewer, waterline and street plan and profile:
1" = 50' horizontal, 1" = 5' vertical
2. Drainage project cross sections:
1" = 5' or 1" = 10' horizontal and vertical
3. Overall development plans, site plans, drainage studies:
1" = 20', 30', 40' or 50'
4. Details:
Not less than 3/8" = 1'-0"

5. Pump Stations

1/2" = 1'-0"

C. Orientation

Whenever possible, drawings should be situated so that north is either toward the top or toward the left side of the sheet. When stationing is required, the stationing should run from South to North and from West to East. North will be to the right when the stationing runs from the South to the North.

D. Plan and Profile Drawings: Sanitary Sewers, Waterlines, Storm Sewers

The upper half of the drawing shall show the utility line in plan, and the lower half shall show the utility line in profile along with the existing and proposed final ground surface. Plan and profile views shall have line designations, station numbers, and other indexing necessary to easily correlate the plan and profile views.

All plan views shall include the following information when applicable:

1. North Arrow.
2. Scales used.
3. Project name and number, sheet number, date drawn, date and nature of revisions.
4. Legend of sanitary sewer and water lines, other utilities and structures.
5. Stationing along the centerline at 100-foot increments.
6. All topography in the area affected by construction.
7. In order to provide gravity service at the elevation of connection, the plans shall indicate the following information:
 - a. The elevation and location of any existing structures to be served by a water and/or sewer connection shall be clearly shown.
 - b. All minimum finished floor elevations and basement elevations are to be shown on plans.
 - c. Ground level at building line on unoccupied structure.
8. Right-of-way lines, property lines (with bearing and distance) and easements, both existing and proposed.
9. Address and lot number on each lot.
10. Locations of all existing or proposed utilities within 20 feet of project or that may otherwise conflict with the proposed sewer or water installation. This requirement applies to existing/proposed utilities such as natural gas, telephone, electric, cable TV.
11. Natural or manmade features that may conflict with construction or installation.
12. Flow arrows showing direction of flow.
13. Pipe with size and material to be installed.
14. Show and locate all appurtenances (bends, tees, crosses, valves, hydrants, manholes, services, etc.).

15. All road, rail or paving crossings should indicate "open cut" if allowed; if not, show length, depth, and size of pipe or casing to be bored or jacked.
16. Match line with station for continued sheets.

All profile views shall include the following information when applicable:

1. North Arrow.
2. Scales used.
3. Project name and number, sheet number, date drawn, date and nature of revisions.
4. Existing and final grade lines.
5. Sewer profiles shall indicate the invert of each pipe in each manhole, the calculated slope in percent of each line section, the final frame and lid elevation of each manhole, and the type of frame and lid if other than standard.
6. Length of pipe.
7. Pipe with size and material to be installed.
8. Crossings of other utilities, existing or proposed. Note the minimum vertical separation required.
9. Stream or water crossings with stream bed elevation and normal and extreme water levels.
10. Water plans shall clearly indicate the intended depth of cover at least twice on each sheet.
11. Fitting locations and configurations, including valves, bends, tees, etc.
12. Stationing along the centerline at 100-foot increments.

E. Detail Sheets

Detail should be provided for all special joints, thrust blocks or restrained joints, cross sections, or appurtenances such as manholes, service connections, elevated piping, pipe bedding, special highway, stream or railroad crossings, or whenever it is necessary for clarity of work or construction.

F. Pump Station Drawings

Pump station plans shall, in general, contain the following:

1. At least two views of the station - plan view and cross-section.
2. Electrical panel detail.
3. Pump and alarm control elevations.
4. Finished grade and foundation elevations.
5. Design pump capacity, horsepower, total dynamic head, manufacturer and model number.
6. Sump capacity and cycle time.
7. The Engineer shall submit a copy of the head discharge curve and the complete design calculations for the pump station and force main.

II. Water Distribution Systems

A. General

1. The following minimum requirements are considered acceptable to the City of Winchester in the distribution of water for domestic consumption. Deviation from these may be allowed if in accordance with sound engineering standards, and if the deviation will not increase the likelihood of a system failure or impact the level of service provided to existing customers on the City of Winchester distribution system.
2. As a general guideline, standards shall be those set forth in Waterworks Regulations, Virginia Department of Health, Title 12, Agency 5, Chapter 590 of the Virginia Administrative Code (VAC).
3. When the City of Winchester standards differ from state and/or federal requirements, the most stringent requirement shall apply.
4. All drawings, specifications, and engineer's reports submitted for approval shall be prepared by or under the supervision of a registered professional engineer with a current registration in the Commonwealth of Virginia in accordance with Title 54.1, Chapter 3 of the Code of Virginia, 1950, as amended. Where applicable, design may be performed under the direction of a certified land surveyor in accordance with Sec. 54.1-408 of the above-cited code. The front cover of each set of drawings, of each copy of the engineer's report, and of each copy of the specifications submitted for review shall bear the signed imprint of the seal of the licensed professional engineer who prepared or supervised the preparation, and shall be signed with an original signature and date.
5. The engineer shall be responsible for obtaining the review and necessary approvals of all drawings and specifications by applicable City, County, State and Federal agencies having jurisdiction. Copies of such approvals shall be submitted to the Winchester Department of Public Utilities at the time of final approval.
6. The developer is required to design and construct his/her system, properly sized and at an appropriate location, to permit future extensions to be made at the limits of the subdivision or development in question.
7. Water and fire protection distribution facilities are to be provided solely for the purpose of supplying potable water and fire protection. Under no circumstances shall cross connections be allowed to unapproved water facilities.
8. Any Contractor that will perform watermain taps, work within watermain easements or make road cuts for the purpose of working on the watermain, must have Class A, Contractor's license.
9. A shutout on any City distribution main must be performed between the hours of 12 midnight and 6 AM. The Contractor must notify the City at least 5 working days in advance of an anticipated shutout. The Contractor must notify all customers affected by a shutout in writing at least 48 hours in advance. The notification must give the date, time, anticipated length customer may be without water and a brief reason for the shutout. A copy of the notice must be given to the City inspector.
10. The use of wells for domestic water service within the City of Winchester is prohibited. Wells cannot be connected to plumbing or the City's system in any way. Well water can be used for irrigation purposes only.

B. Engineer's Report

1. Requests for extensions of waterlines shall be accompanied by an engineer's report, which shall present the following information as applicable:
 - a. A description of the nature and extent of the area to be served. Waterlines are to be designed to serve the entire service area of which the subdivision or development is a part.
 - b. An appraisal of the future requirements for service, including existing and potential connections, provisions for extending the system to include additional area. The engineer should take into consideration flow rates that may be derived for different zoning and land use classification that exists or could exist in the area of development.
 - c. Present and estimated future water consumption values should be used as the basis of design.
 - d. Alternate plans - Where two or more solutions exist for providing public water supply facilities, and each is feasible and practicable, the report shall discuss the alternate plans and give reasons for selecting the one recommended.
 - e. Water modeling shall be required when mains are not looped, when the fire flow test(s) indicate an insufficient "available flow", and for all proposed waterline extensions to serve residential subdivisions, or at the request of the Winchester Department of Public Utilities.

C. Flow Requirements

1. Residential

- a. Residential uses include single family units or townhouses with individual 5/8-inch by 3/4-inch or 1 inch meters.
- b. System shall be designed to maintain a minimum pressure of 20 psi in the distribution system at the design flow (the greater of maximum hour or maximum day plus the applicable fire flows).
- c. Average daily use for a residential service shall be a minimum of three gallons per minute.
- d. The proposed water system shall provide a minimum fire flow of 1,000 gallons per minute. No pumping station shall be used to meet fire flows unless the City of Winchester provides written approval.

2. Nonresidential

- a. The required flow for commercial, industrial or other nonresidential uses shall be as determined by the design engineer and reviewed and approved by the City of Winchester.
- b. Required fire flows for areas other than residential shall be a minimum of 1,500 gallons per minute at a residual pressure of 20 psi. No pumping station shall be used to meet fire flows unless the City of Winchester provides written approval.

D. Fire Flow Test

1. A fire flow test may be required for all water connections made to the City of Winchester water distribution system that serves more than one single residential structure. The fire flow will determine the adequacy of the existing water system to provide a sufficient supply of water.
2. The fire flow test shall consist of three components:
 - a. Fire hydrant flow test. The maximum obtainable fire flow and the residual pressure at such flow shall be determined.
 - b. Twenty-four hours continuous recording of system static pressure.
 - c. Calculation of "available flow" at 20 psi residual pressure.

E. System Design

1. General
 - a. The distribution system developed shall be compatible with the City of Winchester's latest Water Supply Study.
 - b. Dead-end lines should be minimized by the looping of all mains. Where dead ends occur, they shall not exceed 1,000 feet and shall be provided with a fire hydrant for flushing purposes.
 - c. The plans shall provide for future connecting mains by extending construction of all water mains to the exterior boundaries of the development.
 - d. Provisions shall be made to extend the termination point of future connections outside the pavement area. All extensions shall have a valve installed for isolation at the time of future extension.
 - e. A waterline that may be extended shall have a gate valve at the end. There shall be one full joint of pipe on each side of the valve.
 - f. The manufacturer's allowable pipe deflection shall be used to maintain the vertical and horizontal route unless other fittings (i.e. tees and elbows) or methods are specifically called out or are directed by the City.
 - g. Tees shall be cut in when the new main is to be larger than or of equal size to the existing main, or when a new valve is to be installed on the existing main near the location of the new tee.
 - h. No 90 degree bends in the distribution system shall be permitted.
2. Location
 - a. All water mains shall be located to provide service to each lot within a subdivision and to form a looped network.
 - b. All mains shall be installed in dedicated roadways, public rights-of-way, or utility easements dedicated to the City of Winchester. Water lines to be installed in streets shall generally be located 2 feet off the edge of pavement (pavement side) where there is no curb, and 4 feet in front of the face of the curb (pavement side) where there is curb.
 - c. All water meter boxes shall be located between the curb and sidewalk where space permits. Copper service piping shall be extended from

the box to the property line. In other cases, the meter boxes shall be located within 2' of the back of the sidewalk (property side).

d. Easements

- 1) An "easement" shall mean any area to which the City has unlimited access for servicing utility lines.
- 2) Permanent easements shall be a minimum width of 20 feet. Wider easements may be required where more than one facility may occupy an easement, or in consideration of line size, depth or access requirements.
- 3) Off-site easements shall be recorded and the Deed book and Page Numbers of the recordation shown on the utilities plan before approval of the plans for construction.
- 4) Any plantings installed within an easement may be damaged or destroyed during the course of servicing. The City is not liable for damage to any improvements or plantings within an easement. The City will reseed as necessary any bare or disturbed soil for erosion control purposes.
- 5) Small and medium shrubs, groundcovers, or grasses may be planted within an easement. Small trees (under 30 feet in height at maturity) may be planted a minimum of 10 feet from the centerline of the closest pipeline within the easement or 10 feet from the center of the easement, whichever is greater. Small trees as defined above shall include redbuds, fringe tree, serviceberry, crape myrtle, golden raintree, hawthorne, hornbeam, saucer or star magnolia, sassafras, or smoke tree. Large trees shall not be placed within any City Utility easement.

e. Separation of water mains and sewers (both sanitary and storm)

- 1) Parallel installation. Under normal conditions water mains shall be laid at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge to edge.
- 2) Parallel installation. Under unusual conditions when local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer or sewer manhole provided that:
 - a) The bottom of the water main shall be at least 18 inches above the top (crown) of the sewer.
 - b) Where this vertical separation cannot be obtained, the sewer shall be constructed of Class 52, ductile iron water pipe, pressure tested in place without leakage prior to backfilling.
 - c) The sewer manhole shall be of watertight construction and tested in place.
- 3) Crossing. Under normal conditions, water lines crossing sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water line and the top of the sewer whenever possible.

- 4) Crossing. Under unusual conditions when local conditions prevent a vertical separation of 18 inches, the following construction shall be used:
 - a) Sewers passing over or under watermain shall be constructed of Class 52, ductile iron water pipe with Sewper Coat Lining (Griffin).
 - b) Watermain passing under sewers shall be protected by providing:
 - (1) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the watermain.
 - (2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the watermain.
 - (3) The length of the watermain pipe section shall be centered at the point of crossing so that the joints shall be equidistant and as far as possible from the sewer.
- 5) No watermain shall pass through or come in contact with any part of a sewer manhole.

3. Size

- a. The minimum diameter for water distribution mains shall be 6 inches in residential and 8 inches in all other areas.
- b. Standard diameter of piping shall be used with nominal diameters of 6-inch, 8-inch, 10-inch, 16-inch, 20-inch, and 24-inch.
- c. All mains shall be interconnected to form a grid system. Interconnections between 6-inch mains shall not be more than 1,000 feet apart unless authorized in writing by the City of Winchester. Where greater separation of interconnecting mains is necessary, larger diameter mains shall be used.
- d. Primary grids shall be 10-inch diameter or larger pipe and shall be sufficient size to furnish required flow, pressures and velocities.
- e. Velocities of water for the non-fire flow condition in the distribution mains shall not exceed 6 feet per second.

4. Bedding and Backfill

- a. Outside of Traffic Area (see Detail WS-1)
 - 1) The watermain pipe, fittings and appurtenances shall be bedded by hand, or approved mechanical method, from 6 inches below the pipe to 12 inches above the pipe with crushed stone classified as VDOT No. 57. Bedding material shall be deposited in the trench for its full width of each side of the pipe, fitting or appurtenance.
 - 2) From 12 inches above the pipe to the final grade, excavated trench material containing stones no greater than 3 inches in

diameter may be used as backfill material, unless otherwise specified.

b. Within Traffic Area (See Detail WS-2)

- 1) The watermain pipe, fittings and appurtenances shall be bedded by hand, or approved mechanical method, from 6 inches below the pipe to the springline of the pipe with crushed stone classified as VDOT No. 57. Bedding material shall be deposited in the trench for its full width of each side of the pipe, fitting or appurtenance.
- 2) When pipe is constructed within the road, street, driveway or parking lot, granular backfill (VDOT Class 21A) is required for the full depth of backfill. Backfill shall be placed in 6-inch layers and compacted by tamping.
- 3) Granular backfill (VDOT Class 21A) is required for the full depth of backfill where the trench is outside of the pavement but the nearest trench wall is within 5 feet of the edge of pavement.
- 4) Pipe trenches shall be restored within 24 hours. When necessary, trenches may be restored temporarily with cold patch asphalt. When weather permits, temporary trenches must be restored permanently within 7 days.

5. Depth

- a. All lines shall be laid with a minimum cover of 36 inches from the top of pipe to finished ground surface grade. Water main cover shall not exceed 11 feet without City approval.

6. Valves

- a. On distribution mains up to 16 inches in diameter, a sufficient number of valves shall be installed so that no single case of accident, breakage, or repair to the water system will cause the shutdown of a length of pipe greater than 1,000 feet.
- b. Valves on distribution mains larger than 16 inches shall be at intervals providing for sound design and isolation of system segments for maintenance and repair.
- c. Valves shall be located on all branches of a network.

7. Air Release

- a. Hydrants may be used for air release on water mains 12 inches and smaller.
- b. Air release valves shall be provided on mains greater than 12 inches. Valves shall be installed within chambers or pits. The open end of an air release pipe shall be extended from the chamber to a point at least one foot above ground and provided with a screened, downward facing elbow.

8. Road, Railroad or Stream Crossings

- a. Major road crossings and railroad crossings shall be encased in steel casing. Additional requirements of the regulatory agency responsible for the roadway/railway shall be met.
- b. Major stream crossings (where width of 100-year surface elevations exceeds 99 feet) shall be encased in steel casing. Valves shall be provided at both ends of the water crossing; the valves shall be easily accessible and not subject to flooding.

9. Fire Protection Requirements

- a. Fire hydrants serving residential single family developments shall have a maximum spacing between hydrants of 1,000 feet. Each dwelling unit must be within 500 feet of a hydrant installation.
- b. For commercial or multi-family development, fire hydrants shall have a minimum spacing of 600 feet between hydrants and each structure shall be within 300 feet of a hydrant.
- c. Distances between fire hydrants shall be measured along with centerline of roadway surface or fire lane.
- d. For industrial buildings with a fire suppression system, a fire hydrant must be located within 150 feet of the siamese connection to the fire suppression system. In addition, all industrial buildings must have a fire hydrant within 300 feet of all portions of the structure.
- e. All hydrants shall have a valve installed between the main and the hydrant.

10. Cross Connection Control

- a. All water meters shall be equipped with a backflow preventer. The backflow preventer on meter setters shall be an integral dual check valve.
- b. Non-residential backflow preventers shall be either a double check assembly or a reduced pressure zone backflow preventer, depending upon whether the connection is considered to be a high hazard service as determined by the Department of Public Utilities. Detector type, double check assemblies shall be required on privately owned and maintained fire lines where processed water or fluids are not involved. On fire suppression systems where chemicals are added by the user on site to prevent freezing, pipe corrosion, etc., backflow prevention shall be provided by using an approved reduced pressure zone (RPZ), detector type preventer.
- c. Non-residential and irrigation backflow preventers shall be installed outside of the City's right-of way or easement in a separate enclosure. The maintenance, testing and repair of such backflow preventers shall be the responsibility of the customer. These units shall be tested annually by an authorized technician, and the test results shall be submitted to the Department of Public Utilities. Failure to test and/or maintain non-residential and irrigation backflow preventers may result in termination of water service.

F. Materials

1. General

- a. Whenever proprietary equipment is specified, "or approved equal" is implied. All proposals for substitution shall be submitted in writing to the City of Winchester Department of Public Utilities for their approval.

2. Water Mains

- a. Ductile iron pipe shall be used for water lines 4 inches and larger in diameter. The ductile iron pipe shall conform to the requirement of AWWA Standard C151. Pipe shall be Class 52 minimum with cement-mortar lining and a bituminous seal coating conforming to the requirements of AWWA C105.
- b. In severely corrosive soils, ductile iron pipe shall be encased in polyethylene in accordance with AWWA C105.

3. Pipe Fittings

- a. All pipe fittings shall be ductile iron conforming to AWWA C-110, C-111, C-153. Fittings shall be cement-mortar lined and with a bituminous seal coat.
- b. Fittings shall be short body standard with mechanical joints for buried installation and flanged for interior and exterior exposed installations.
- c. All fittings shall have a pressure rating of 350 psi or greater.
- d. Mechanical joint restraint for ductile iron fittings shall be incorporated in the design of the retainer gland. The gland shall include a restraining mechanism which, when activated, imparts multiple wedging action against the pipe which increases its resistance as pressure increases.
- e. Glands shall be designed to allow flexibility of pipe joints after installation and backfill. Glands shall be manufactured of ductile iron, conforming to ASTM A536-80. Glands shall have U.L. listing through 24-inch in size and Factory Mutual approval through 12-inch.
- f. Retainer glands shall be used on each side of fittings where the watermain changes direction. Additional sets of retainer glands are required at pipe lengths above and below fittings as required.
- g. Retainer glands shall be Megalug Series 1100, Ford Meter Box Co. Series 1400, or approved equal.
- h. Thrust restraint on slip joint ductile iron pipe shall be U.S. Pipe Field Loc gaskets for Tyton joint pipe or approved equal. Field Loc gaskets shall be permitted for use only outside of the roadway.

4. Valves

- a. Direct Bury Gate Valves
 - 1) Gate valves 12 inches and smaller shall be of the tight-closing resilient seated gate valves, which meet or exceed the requirements for AWWA C-515.

- 2) All resilient seat valves are to be ductile iron body, internally reinforced molded natural rubber mounted, wedged disc, non-rising stem, tapered seat type.
- 3) Valves shall have a clear, unobstructed water way when fully opened and shall be at least as large as the pipe inside diameter for which it is intended.
- 4) Valves shall open counterclockwise and seating shall use compression closure.
- 5) Valve end connections shall be mechanical joint.
- 6) Top operating nut shall be 2-inch square operating nut.
- 7) The operating stem shall be a minimum diameter of 7/8-inch with a triple O-ring seal. The configuration of the O-rings shall be two above and one below the thrust collar.
- 8) Valves must have a 250 psi working pressure and 400 psi test pressure.
- 9) Valves installed with more than 5 feet of cover shall have extension rods added to bring the operating nuts to within 3 feet of the surface.
- 10) Manufacturer shall be Mueller Company (Model 2360), American Flow Control (Series 2500 Resilient Wedge Valve), Kennedy (Model #7571 D.B.) or approved equal.

b. Exposed Gate Valves

- 1) Valves shall meet requirements for direct bury valves with the following exceptions:
 - a) Joints shall be flanged.
 - b) Valve shall be rising stem.
 - c) Valve will be manually opened using a handwheel.
 - d) Outside screw and yoke (OS & Y) type.

c. Butterfly Valves

- 1) All water main 16 inches and greater in diameter shall use butterfly valves.
- 2) All butterfly valves shall conform to the requirement specified for tight-closing rubber seated butterfly valves in AWWA C504.
- 3) Valve bodies shall be close grained cast iron ASTM A126, Class B, or ductile iron ASTM Grade 65-45-12.
- 4) Valves shall be epoxy-coated interior and exterior. This requirement applies to all interior ferrous parts including the disc.
- 5) Operator shall be travelling nut type and fully enclosed. The valves shall be counterclockwise opening.
- 6) Actuator shall be manual with handwheel.
- 7) Butterfly valves shall be DeZurick BAW, AWWA butterfly valves, Class 250, Henry Pratt Company HP250 (butterfly valve for buried service) or approved equal.

d. Combination Air Release and Vacuum Valves

- 1) Air release valves shall be provided on watermains greater than 12 inches in diameter.
- 2) Combination air release and vacuum valves shall function to automatically release small pockets of air which may accumulate while the system is pressurized and operating.
- 3) Valve shall be cast iron valve body and cover, stainless steel ball, stainless steel trim and resilient seat.
- 4) The air vent shall close drip tight, incorporating a renewable seat, which is field replaceable.
- 5) Minimum pressure rating: 250 psig.
- 6) Size: 2 inch
- 7) Valves shall be Val-matic model No. 202.C.2 or approved equal.

e. Valve Box Assemblies

- 1) Valve boxes are to be installed on all valves within the water network. These boxes shall be two piece and screw type for adjustment to finish grade.
- 2) Valve box shall be furnished with a 5-1/4 inch lid made of cast iron and marked "Water".
- 3) When valve may be subjected to traffic, the top of the valve box shall be flush with the final surface. An 18" x 18" concrete pad (6" thick) is required around valve boxes installed outside of pavement area.

5. Tapping Sleeves and Valves

- a. Tapping sleeves shall be ductile iron construction meeting ASTM Grade 65-45-12. Side flange seals shall be of the O-ring type. Sleeves shall be coated with asphaltic varnish in compliance with NSF-61.
- b. Stainless steel tapping sleeves may be used on pipe sizes 6 inch through 30 inch and shall be Ford Style FAST or FTSS, or approved equal.
- c. Tapping sleeves shall be American Flow Control Series 2800, or approved equal.
- d. Valves shall be American Flow Control Series 2500 resilient wedge valve or approved equal.
- e. Tapping valves shall be resilient seat type with bodies and bonnets made of ductile iron for 250 psi working pressure. Cutters used shall be at least 1/4-inch smaller than the valve size.

6. Fire Hydrants

- a. Hydrants shall be dry barrel conforming to AWWA C502, and have a traffic breakaway flange and stem coupling.
- b. Design of the hydrant shall be of the compression type main valve and O-ring seal between the operating nut and bonnet.

- c. Traffic breakaway flange shall be installed 4 inches from the final grade.
- d. Hydrant shall have a 6-inch inlet and a 4-1/2 inch valve opening. Outlets shall be one 4-1/2 inch streamer nozzle and two 2-1/2 inch hose nozzles. Outlet nozzles shall be field replaceable utilizing straight threads or quarter turn seal by an O-ring. Each nozzle cap shall be equipped with chain and gasket.
- e. Hydrant shall open right (clockwise) utilizing a pentagon shaped nut 1-1/2 inch in size.
- f. Install "out-of-service" signs on new fire hydrants until all testing is complete and the hydrants become active.
- g. Fire hydrants to be used as air release shall:
 - 1) Provide positive slope upward from hydrant tee to fire hydrant base.
 - 2) Mechanical joint ductile iron pipe and fittings with retainer glands at each fitting required.
 - 3) Tee into main at top of pipe.
- h. Hydrants shall be American Darling, Model MK-73-2, as manufactured by American Flow Control, Kennedy Valve Guardian K81D, or approved equal. Upper barrel, lower barrel and base must be ductile iron. Base bolts and nuts must be stainless steel.
- i. Hydrant shall have a solid base surrounding the barrel no less than 24 inches by 24 inches by 6 inches deep. The solid base shall include high density concrete. Tamped soil is not considered a solid base.

7. Water Services

a. 3/4-inch Water Service

- 1) Water services to be installed in accordance with the City of Winchester Standard Details.
- 2) Corporation stops shall conform to AWWA C800, minimum pressure rating of 250 psi, 3/4-inch ball style, as manufactured by Ford, Model FB1000, A.Y. McDonald Model 4701B-22, or approved equal. Connection at corporation stop shall be flared or compression.
- 3) Service line shall be 3/4-inch ID type "K" copper tubing and shall be one continuous piece from corporation stop to meter setting.
- 4) Meter setting shall consist of a meter yoke, inlet angle valve, and outlet double check valve. The meter setting shall have two independent vertical cartridge check valves and be in conformance with ASSE 10024. Meter setting shall include:
 - iron yoke bar (Ford model Y502, A.Y. McDonald model 14-2)
 - iron yoke expansion connector (Ford Y502, A.Y. McDonald model 14-2 EHG)
 - yoke angle dual check valve (Ford HHCA94-323TV, A.Y. McDonald 112W3Y2 33)
 - yoke angle ball valve (Ford BA94-223W, A.Y. McDonald 4642BY-22 3/4x5/8x02)

- 5) Meter box shall be 18 inches in diameter and 30 inches tall, high density polyethylene (HDPE), with an 18-inch diameter frame and 11-1/2 inch diameter hinged lid. Meter box shall have a 10,000 lb minimum crush rating and shall have a minimum wall thickness of 1/2 inch. Frame and lid shall be made of cast iron. Frame and lid shall be Ford meter box cover X32T. Traffic rated lids are required in areas subject to traffic; frame and lid shall be Ford meter box cover X32H.
- b. 1-inch Water Service
- 1) Water services to be installed in accordance with the City of Winchester Standard Details.
 - 2) Corporation stops shall be 1-inch and shall conform to AWWA C800, as manufactured by Ford, Model FB1000, A.Y. McDonald model 4701B-22, or approved equal.
 - 3) Service line shall be 1-inch ID type "K" copper tubing and shall be one continuous piece from corporation stop to meter setting.
 - 4) Meter setting shall consist of a meter yoke, inlet angle valve, and outlet double check valve.
 - 5) Meter box shall be 24 inches in diameter and 30 inches tall, high density polyethylene (HDPE). Frame and lid shall be made of cast iron. Frame and lid shall be Ford meter box cover X32T. Traffic rated lids are required in areas subject to traffic; frame and lid shall be Ford meter box cover X32H.
- c. 1-1/2 inch and 2-inch Water Services
- 1) Water services to be installed in accordance with the City of Winchester Standard Details.
 - 2) Corporation stops shall be 2 inches in size and shall conform to AWWA C800, as manufactured by Ford, or approved equal.
 - 3) Service line shall be 2-inch ID type "K" copper tubing and shall be one continuous piece from corporation stop to meter setting.
 - 4) Meter shall be set in a custom meter setting consisting of flanged angle valve on the inlet and outlet. Include bypass with ball valve and locking cap.
 - 5) Meter box shall be 5'-0" long x 3'-8" wide x 3'-11" deep as shown in Standard Detail WD-4. A precast manhole section, 48 inches in diameter and 48 inches tall is also acceptable.
 - 6) Access door shall be as manufactured by Bilco Door Company, Type PCM-2, or Halliday Products Model W1S3030. Dimensions shall be 2'-6" x 2'-6".
 - 7) Backflow device shall meet with applicable plumbing codes and City of Winchester Ordinance. Device must be installed outside of meter box.
- d. Meter shall be paid for by the customer and supplied by the City of Winchester Department of Public Utilities. Meters 1-inch and larger require notification of 30-60 days for delivery and installation.

G. Cleaning, Testing and Disinfection

1. General

- a. All lines shall be thoroughly cleaned and free of debris, trash or other foreign materials.
- b. Backfill and compaction shall be completed before testing.
- c. All valves must be completely opened and closed and all corporation stops and service lines in place prior to testing.
- d. Any valves that need to be operated in the existing system shall only be operated by the City of Winchester personnel.
- e. Hydrostatic and bacterial testing shall be performed within 30 days after the completed water main has been charged (filled).

2. Pressure and Leakage Test

a. General - Distribution Mains

- 1) Testing shall be in accordance with the Virginia Department of Health and AWWA C600.
- 2) Test pressure shall not exceed pipe or thrust-restraint design pressures.
- 3) Test pressure shall not vary for the duration of the test.
- 4) Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.
- 5) When hydrants are in the test section, the test shall be made against open hydrant valves.

b. Test Procedure - Distribution Mains

- 6) After the pipe has been laid all pipe shall be subjected to a hydrostatic pressure of not less than 150 psi or 1.25 times the working pressure at the highest point along the test section.
- 1) Each section of pipe to be tested shall be slowly filled with water.
- 2) Expel all air from pipeline.
- 3) Apply 100 percent of required test pressure at beginning of test. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.
- 4) Maintain test pressure for a minimum of 2 hours.
- 5) Leakage is defined as the amount of water that must be supplied into the newly laid pipe to maintain the test pressure, after the pipe has been filled with water and the air has been expelled.
- 6) There shall be zero leakage during the test period.
- 7) If the leakage is greater or the pressure cannot be maintained, the contractor shall locate and make approved repairs as necessary until the leakage is within the specified tolerance.
- 8) All visible leaks are to be repaired, regardless of the amount of leakage.

c. Test Procedure - Fire Lines

- 1) Test procedure is the same as described above, except that the test pressure shall be 200 psi, duration of test is 1 hour. There shall be zero leakage during the 1-hour test period.

3. Disinfection

- a. Disinfection shall be performed after the pressure testing has passed and approved by the City of Winchester.
- b. All water mains shall be disinfected and bacteriological testing completed immediately prior to being placed in operation.
- c. The basic disinfection procedure consists of:
 - 1) Preventing contamination materials from entering the water main during storage, construction or repair.
 - 2) Removing, by flushing or other means, those materials that may have entered the water main.
 - 3) Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the main. A newly installed main shall be disinfected in accordance with AWWA C651, and the Virginia Department of Health regulations.
 - 4) Protecting the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
 - 5) Determining the bacteriological quality by laboratory test after disinfection.
 - 6) Final connection of the approved new main to the active distribution system.
- d. Chlorination shall be by the tablet method, unless otherwise approved in writing by the City of Winchester. This method may be used only if the pipe and appurtenances are kept clean and dry during construction. Alternate disinfection procedures may be required at the option of the City of Winchester if the circumstances are such that the pipe and appurtenances are not kept clean and dry.
 - 1) During construction, 5-g calcium hypochlorite tablets shall be placed in each section of pipe. Also, one such tablet shall be placed in each hydrant, hydrant branch and other appurtenances. Table 1 shows the number of tablets required for commonly used sizes of pipe.

Table 1. Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/l

Pipe Diameter (inches)	Length of Pipe Section, ft				
	<= 13	18	20	30	40
	Number of 5-g calcium hypochlorite tablets				
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

- 2) Filling and contact. When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 ft/s. Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours.
- e. Final flushing: After the required retention period, the chlorinated water shall be flushed from the main using potable water. However, the chlorinated water shall not be flushed out until the residual is less than 1 mg/L. A reducing agent shall be applied as required to achieve this residual.
- f. After final flushing and before the main is placed in service, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the main. At least one set of samples shall be collected from every 1,000 feet of the new main, plus one set from the end of the line and at least one set from each branch. Samples shall be collected in the presence of an inspector for the Department of Public Utilities in bottles provided by the City. Samples shall be tested for bacteriologic quality by the City of Winchester, and shall show the absence of coliform organisms. If contamination is indicated, then the disinfection/testing procedure must be repeated.

III. Sanitary Sewer Collection Systems

A. General

1. The following minimum requirements are considered acceptable to the City of Winchester in the collection of wastewater from residential and nonresidential customers. Deviation from these may be allowed if in accordance with sound engineering standards, and if the deviation will not increase the likelihood of a system failure or impact the level of service provided to existing customers on the City of Winchester collection system.
2. As a general guideline, standards shall be those set forth in Sewerage Regulations, State Department of Health, Title 12, Agency 5, Chapter 580 of the Virginia Administrative Code (VAC), as amended.
3. When the City of Winchester standards differ from state and/or federal regulations, the most stringent requirement shall apply.
4. All drawings, specifications, and engineer's reports submitted for approval shall be prepared by or under the supervision of a licensed professional engineer legally qualified to practice in Virginia, or a professional surveyor with a Class B license issued by the Commonwealth of Virginia. Where applicable, design may be performed under the direction of a certified land surveyor in accordance with Sec. 54.1-408 of the above-cited code. The front cover of each set of drawings, of each copy of the engineer's report, and of each copy of the specifications submitted for review shall bear the signed imprint of the seal of the licensed professional engineer who prepared or supervised the preparation, and shall be signed with an original signature and date.
5. The engineer shall be responsible for obtaining the review and necessary approvals of all drawings and specifications by applicable City, County, State and Federal agencies having jurisdiction. Copies of such approvals shall be submitted to the Winchester Department of Public Utilities at the time of final approval.
6. The developer is required to design and construct his/her system, properly sized and at an appropriate location, to permit future extensions to be made at the limits of the subdivision or development in question.
7. The City of Winchester has a Sewer Use Ordinance that regulates discharge to the collection system. Waste from commercial/industrial users may require pretreatment prior to discharge to the collection system.
8. Restaurants, bakeries, and other facilities involved in the preparation of food have the potential to discharge oil and grease to the sanitary sewer system. It is the discharger's responsibility to install and properly maintain such a pretreatment system to ensure that oil and grease are not discharged to the sanitary sewer in accordance with the Winchester City Code. Oil/water separators, where required, shall be shown on the plans and shall comply with the requirements of the Plumbing Code.
9. Any Contractor that will perform sewer main taps, work within sewer easements or make road cuts for the purpose of working on the sanitary sewer, must have Class A, Heavy Highway contractor's license.

B. Engineer's Report

Requests for extensions of sewer lines shall be accompanied by an engineer's report, which shall present the following information as applicable:

1. A description of the nature and extent of the area to be served. Sewer lines are to be designed to serve the entire service area of which the subdivision or development is a part. Elevation of the sewer system must be designed such that future extensions can serve the entire area that naturally drains toward the system.
2. An appraisal of the future requirements for service, including existing and potential connections, provisions for extending the system to include additional area. The engineer should take into consideration flow rates that may be derived for different zoning and land use classification that exists or could exist in the area of development.
3. Average daily flow and peak hourly flow.
4. Design flow and capacity for each pipe segment.

C. Flow Requirements

1. Residential

- a. Residential uses include single family units or townhouses.
- b. Average daily flow for residential areas shall be based on 350 gallons per day per unit.
- c. When deviations from the above per dwelling rates are proposed, flow data from existing similar developments shall be included with the submission.

2. Nonresidential

- a. The required flow for commercial, industrial or other nonresidential uses shall be as determined by the engineer and reviewed and approved by the City of Winchester.
- b. For considering development of surrounding areas where land is zoned for industrial or commercial usage, and to insure adequate capacity upon development, design shall be based on an average daily flow of 4,000 gallons per day per acre.

3. Peak flow — lateral and sub-main sewers

- a. Lateral — a sewer that has no other common sewers discharging into it.
- b. Sub-main — a sewer that receives flow from one or more lateral.
- c. Minimum peak design flow should be 400 percent of the average design flow.

4. Peak flow — Main, trunk and interceptor sewers

- a. Main or trunk — a sewer that receives flow from one or more sub-main sewers.
- b. Interceptor — a sewer that receives sewage flow from a number of gravity

- mains, trunk sewers, force mains, etc.
- c. Minimum peak design flow should be 250 percent of the average design flow.

D. System Design

1. General

- a. The plans shall provide for future connections by extending mains to the exterior boundaries of the development when applicable.
- b. The collection system developed shall be compatible with the City of Winchester's comprehensive sewer plan.

2. Location

- a. Mains shall be located to provide service to each lot within a subdivision. All mains shall be installed in dedicated roadways, public rights-of-way, or utility easements dedicated to the City of Winchester.
- b. All manholes proposed within areas where vehicles travel shall be located either on the centerline of the road or center of the traveling lane.
- c. All lateral services shall provide a cleanout at the edge of the public rights-of-way or easement or between the curb and sidewalk. Lateral piping shall be extended to the property line for all new development.
- d. A private lateral shall not be located parallel within road right-of-way.
- e. Every effort should be made to locate sewers outside of flood prone areas. Sewer lines and/or manholes shall not be located in drainage ditches, or pass under stormwater detention facilities.
- f. Separation of water mains and sewers
 - 1) Parallel installation. Under normal conditions water mains shall be laid at least 10 feet horizontally from a sewer or sewer manhole. The distance shall be measured edge-to-edge.
 - 2) Parallel installation. Under unusual conditions when local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer or sewer manhole provided that:
 - a) The bottom of the water main shall be at least 18 inches above the top (crown) of the sewer.
 - b) Where this vertical separation cannot be obtained, the sewer shall be constructed of Class 52, ductile iron water pipe, pressure tested in place without leakage prior to backfilling.
 - c) The sewer manhole shall be of watertight construction and tested in place.

- 3) Crossing. Under normal conditions, water lines crossing sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water line and the top of sewer whenever possible.
- 4) Crossing. Under unusual conditions when local conditions prevent a vertical separation of 18 inches, the following construction shall be used:
 - a) Sewers passing over or under watermain shall be constructed of Class 52, ductile iron water pipe with Sewper Coat Lining (Griffin).
 - b) Watermain passing under sewers shall be protected by providing:
 - (1) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the watermain.
 - (2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the waterline.
 - (3) The length of the watermain pipe section shall be centered at the point of crossing so that the joints shall be equidistant and as far as possible from the sewer.
- 5) No watermain shall pass through or come in contact with any part of a sewer manhole.
- g. Where the sanitary sewer is installed parallel to a storm drainage structure, there shall be at least 10 feet horizontally, measured center to center, between them. In a crossing installation, a minimum separation of 12 inches measured from edge to edge shall be provided.
- h. In cases where sanitary sewers are to be constructed on steep grades (20 percent or greater), sewers shall be anchored securely with concrete anchors or other approved means. Suggested minimum anchorage is as follows, but should be determined by the Engineer:
 - 1) Not over 36 feet center to center on grades 20 percent to 35 percent.
 - 2) Not over 24 center to center on grades 35 percent to 50 percent.
 - 3) Not over 16 feet center to center on grades 50 percent and over.
- i. Easements
 - 1) An "easement" shall mean any area to which the City has unlimited access for servicing utility lines.
 - 2) Permanent easements shall be a minimum width of 20 feet. Wider easements may be required where more than one facility may occupy an easement, or in consideration of line size, depth or access requirements.
 - 3) Off-site easements shall be recorded and the Deed book and Page Numbers of the recordation shown on the utilities plan before approval of the plans for construction.
 - 4) No building or other structure shall be erected over permanent easements.

- 5) Any plantings installed within an easement may be damaged or destroyed during the course of servicing. The City is not liable for damage to any improvements or plantings within an easement. The City will reseed as necessary any bare or disturbed soil for erosion control purposes.
- 6) Small and medium shrubs, groundcovers, or grasses may be planted within an easement. Small trees (under 30 feet in height at maturity) may be planted a minimum of 10 feet from the centerline of the closest pipeline within the easement or 10 feet from the center of the easement, whichever is greater. Small trees as defined above shall include redbuds, fringe tree, serviceberry, crape myrtle, golden raintree, hawthorne, hornbeam, saucer or star magnolia, sassafras, or smoke tree. Large trees shall not be placed within any City Utility easement.

3. Size

- a. No gravity main shall be less than 8 inches in diameter.
- b. Standard sizes of gravity mains shall have nominal diameters of 8 inches, 10 inches, 12 inches, 15 inches, 21 inches, 24 inches, 30 inches and 36 inches.
- c. In general, the pipe diameter of sub-trunk and trunk sewers should be continually increasing with increase in tributary flow.
- d. Changes in pipe size or material shall not occur between manholes.

4. Bedding and Backfill

a. Outside of Traffic Area (see Detail)

- 1) The sewer main pipe, fittings and appurtenances shall be bedded by hand, or approved mechanical method, from 6 inches below the pipe to 12 inches above the pipe with crushed stone classified as VDOT No. 57. Bedding material shall be deposited in the trench for its full width of each side of the pipe, fitting or appurtenance.
- 2) From 12 inches above the pipe to the final grade, excavated trench material containing stones no greater than 3 inches in diameter may be used as backfill material, unless otherwise specified.

b. Within Traffic Area (See Detail WS-2)

- 1) The sewer main pipe, fittings and appurtenances shall be bedded by hand, or approved mechanical method, from 6 inches below the pipe to the springline of the pipe with crushed stone classified as VDOT No. 57. Bedding material shall be deposited in the trench for its full width of each side of the pipe, fitting or appurtenance.
- 2) When pipe is constructed within the road, street, driveway or parking lot, granular backfill VDOT Class 21A) is required for the full depth of backfill. Backfill shall be placed in 6-inch layers and compacted by tamping.

- 3) Granular backfill (VDOT Class 21A) is required for the full depth of backfill where the trench is outside of the pavement but the nearest trench wall is within 5 feet of the edge of pavement.
- 4) Pipe trenches shall be restored within 24 hours. When necessary, trenches may be restored temporarily with cold patch asphalt. When weather permits, temporary trenches must be restored permanently within 7 days.

5. Depth

- a. The minimum depth of sewer lines subject to traffic loads shall be 6 feet of cover above the top of pipe. Sewer lines in easements not subject to traffic loads shall have a minimum of 3 feet of cover above the top of pipe.
- b. When conditions are such that minimum cover can not be achieved, the City of Winchester may consider the use of SDR26 PVC pipe. Such conditions shall be considered on a case by case basis and approval must be obtained in writing from the City of Winchester Public Utilities Department.

6. Pipe Slope

- a. All gravity sewers shall be designed and constructed to give mean velocities, when flowing full, of between 2 and 10 feet per second, based on Manning's formula and using "n" value of 0.013. The minimum velocity requirement is necessary to prevent the deposition of solids. The following are minimum slopes to be provided; however, slopes greater than these are desirable:

Sewer Diameter	Minimum Slope in feet per 100 feet
8 inch	0.40
10 inch	0.28
12 inch	0.22
15 inch	0.15
18 inch	0.12
21 inch	0.10
24 inch	0.08
30 inch	0.06
36 inch	0.05

- b. A velocity in excess of 10 feet per second may be permitted with proper consideration of pipe material, abrasive characteristics of the wastewater, turbulence, and thrust at changes in direction.

7. Manholes

- a. Manholes shall be provided at all intersections of gravity sewer mains,

- changes in grade, alignment, direction or changes in sewer line pipe size.
- b. The maximum distance permitted between manholes is 400 feet.
- c. All sewer lines shall have a 0.1 feet drop through the manhole. Where sewer lines change direction, the invert elevation shall drop 0.25 feet (typical) through the manhole.
- d. Manholes shall be installed at the termination of a sewer line or at the end of any gravity main that can be extended in the future to serve adjacent properties.
- e. Watertight manhole covers are to be used whenever the manhole is subject to flooding or is located within the 100-year flood plain.
- f. Manholes located along streams, creeks, or other bodies of water may be required to be extended above the 100-year flood plain.
- g. Manholes located within an easement shall be extended 18 inches above ground level.
- h. Drop manholes may be used if the invert of the upstream sewer is 2 feet or more above the top of the downstream sewer leaving the manhole. All drops shall be exterior as shown in the City of Winchester standards.
- i. All lines 6-inch diameter and larger sewers must be connected to the collection system through a manhole.
- j. The minimum horizontal angle between the upstream and downstream sewer shall be 90 degrees.

8. Road, Railroad and Stream Crossings

- a. Major road crossings and railroad crossings shall be encased in steel casing and piping shall be ductile iron. Additional requirements of the regulatory agency responsible for the roadway/railroad shall be met.
- b. Stream crossings shall be encased in steel casing or made with bell-joint ductile iron pipe. Manholes shall be provided at both ends of the water crossing; the manholes shall be easily accessible and not subject to flooding.

9. Sewage Pump Stations and Force Mains

- a. Sewage pump stations will be used only when it has been determined to be the only practical way to provide sanitary service and upon approval of the Winchester Department of Public Utilities.
- b. A detailed engineering report shall be submitted to and approved by the Winchester Department of Public Utilities.
- c. The design must conform to the minimum standards set forth in the Virginia Department of Health Sewerage Regulations. At a minimum, the following data shall be provided:
 - 1) Complete design calculations for the pump station and force main, including the head discharge curve.
 - 2) At least two views of the pump station, plan view and cross section, shall be provided.
 - 3) Electric panel detail.
 - 4) Pump and alarm control elevations.
 - 5) Inlet and outlet pipe elevations.
 - 6) Finished grade and foundation elevations.
 - 7) Design pump capacity, horsepower, total dynamic head,

manufacturer and model number.
8) Sump capacity and cycle time.

- d. The design shall provide for continuous operability of the pump station by including an auxiliary stand-by generator that can operate sufficient pumps to deliver the design peak flow, subject to the approval of the Winchester Department of Public Utilities.
- e. Force mains shall be designed with a minimum flow velocity of 3.0 feet per second, and a maximum flow velocity of 8.0 feet per second. Minimum size shall be 4-inches in diameter. A constant grade shall be used where feasible. Valves shall be provided at appropriate locations.

E. Materials

1. General

- a. Whenever proprietary equipment is specified "or approved equal" is implied. All proposals for substitution shall be submitted in writing to the City of Winchester Department of Public Utilities for their approval.

2. Gravity Mains

- a. Sanitary sewers shall be polyvinylchloride (PVC) SDR 35 pipe and shall meet or exceed ASTM D-3034. Joints shall be gasketed, bell and spigot type with the bell made integral with the pipe.
- b. Each length of pipe shall be marked with the manufacturer's name, trade name, nominal size, class, hydrostatic test pressure, manufacturer's standard symbol to signify it was tested, and date manufactured.

3. Force mains shall be pressure class PVC or ductile iron.

4. Lateral Piping

- a. PVC pipe used for installation of lateral services shall be 4-inch unless otherwise specified and have a minimum wall thickness of SDR 21. All fittings shall be gasketed.
- b. 4-inch gasketed long turn tee wye as shown in the standard detail shall be factory fabricated from a PVC D.W.V. long turn tee wye that has a minimum lateral dimension of 12-inches from centerline to the end of bell. Tee wye shall be specially factory fabricated using SDR 21 gasket by socket adapters as required.
- c. D.W.V. fittings shall comply with ASTM D-2665, and be socket by socket. Gasketed adapter shall meet ASTM D-3139 with gaskets meeting ASTM F-477.
- d. 4-inch main line and lateral cleanout wyes shall be gasket by gasket by gasket on stand pipe lead.
- e. Cleanouts for 4-inch laterals shall be 4-inch cast iron gasketed cleanouts with a recessed brass screw plug, Panella model PA4SV-CSK.
- f. Lateral connections to an existing sewer shall be made with a boot-n-saddle with stainless steel straps and appropriate rubber fitting.

- g. Cleanouts subject to traffic or in the sidewalk area shall have a cleanout frame and cover. Cleanout frames and covers shall be Capitol Foundry model B-1140 or approved equal.

5. Pipe Fittings

- a. PVC fittings used in a gravity collection system shall be of the same SDR rating as the collection pipe being used.
- b. Fittings are permitted only on service laterals and drop manholes in gravity collection system.
- c. Fittings used in a force main system shall be mechanical joint and made of ductile iron. Ductile iron fittings shall be Class 350 conforming to ASTM A536-72. Nominal thickness of fittings shall be equal to Class 54 ductile iron. All fittings shall be cement lined.

6. Valves - Force Main System

a. Direct Bury Valves

- 1) All valves shall be resilient seat conforming to requirements of AWWA Standard C509. They shall be manual opening, non-rising stem equipped with a 2-inch square operating nut for installation in the vertical position.
- 2) The valve body shall be made of ductile iron with mechanical joints. The body of the valve shall be epoxy-coated interior and exterior, and have a smooth bottom design.
- 3) Valve shall open left (counterclockwise) and seating shall use compression closure.
- 4) The operating stem shall be a minimum diameter of 7/8 inch with a double O-ring seal. The configuration of the O-rings shall be above and below the thrust collar.
- 5) Valves must have a 250 psi working pressure and 400 psi test pressure.

b. Exposed Gate Valves

- 1) Valves shall meet requirements for direct bury valves with the following exceptions:
 - a) Joints shall be flanged.
 - b) Valve shall be rising stem.
 - c) Valve will be manually opened using a handwheel.
 - d) Outside-screw-and-yoke (OS & Y) type.

c. Combination Air Release and Vacuum Valves

- 1) The air vent (release) shall be float operated and shall incorporate a simple level mechanism to enable the valve to automatically release accumulated air while the system is pressurized and operating.
- 2) All combination air release and vacuum valves shall be installed in

a vault as set forth in the Standard Details.

- 3) The air vent shall close drip-tight, incorporating a renewable seat that is field replaceable.
- 4) The body and cover of the air vacuum release assembly shall be made of case iron conforming to ASTM A48, Class 35. All interior parts of the assembly shall be stainless steel.
- 5) Valves shall be Val-matic No. 801 BWA or approved equal.

7. Manholes

- a. Manholes shall be precast reinforced concrete capable of sustaining an H-20 loading and meeting standards put forth under ASTM C-478.
- b. Manholes shall have a minimum inside diameter of 48 inches with a minimum wall thickness of five inches.
- c. The base section shall be monolithic to a point 12 inches above the crown of the incoming pipe with a minimum base thickness of 8 inches. The base shall have a diameter 12 inches larger than the barrel of the manhole.
- d. Pipe holes in new manholes shall be properly located and cast in place with appropriate boot (Chardon Rubber Company or approved equal). After assembly, pipe to be grouted in place using non-shrinking grout inside the manhole.
- e. Services into existing manholes may be cored and shall be sealed using Kor-N-Seal or Lock-Joint with two stainless steel bands by Dukor Co., Milford, NH, to hold the pipe in position.
- f. Cone sections shall be eccentric narrowing from 48 inches to 24 inches inside diameter.
- g. Flat top sections shall be used in place of a cone section for manholes less than 5 feet deep. The 24-inch access hole shall be offset to allow easy access to steps and shall be reinforced to support H-20 loading.
- h. The exterior of the manhole shall be covered with fibrous bitumastic coating.
- i. Manhole steps conforming to the applicable provisions of ASTM Specifications C 478 such as aluminum 14967 as manufactured by Alcoa or plastic steps manufactured by MA Industries or equal, shall be factory built into precast sections. Step spacing and alignment to be maintained uniform and vertical throughout the depth of the manhole.
- j. Each manhole section shall have not more than two holes for the purpose of handling and laying. These holes shall be sealed with cement mortar.
- k. Joints of the manhole sections shall be of the tongue and groove type; sections shall be joined using O-ring rubber gaskets.
- l. All joints, holes, etc., shall be sealed with cement mortar.

8. Manhole Frame and Cover

- a. Manhole frames and covers shall conform to ASTM A-48. The words "sanitary sewer" shall be cast into the cover and shall be plainly visible.
- b. Manhole frames and covers shall be as manufactured by Capitol Foundry of Virginia, Item No. MH-3000 EC*, Pattern No. 1611, or approved equal.
- c. Watertight frames and covers, as applicable, shall be as manufactured by Capitol Foundry of Virginia, Item No. MH-3000 WT*, Pattern No. 1593, or

approved equal.

F. Inspections and Testing

1. General

- a. All costs of cleaning, inspection and testing are to be borne by the Contractor and/or Developer.
- b. Cleaning, televising and testing shall be performed a minimum of 30 days after the completion of backfill and compaction, and shall be witnessed by the City. The Contractor or Developer shall contact the City at the start of the waiting period.
- c. Any portion of the sanitary sewer system failing to meet the inspection or testing requirements of the City of Winchester shall be corrected to the satisfaction of the City. The costs for such corrections shall be borne by the Contractor and/or Developer.
- d. All repair methods, other than replacement of the defective areas with new materials, shall be subjected to prior approval of the City. Grouted, collared, clamped, or otherwise patched sewer pipe shall not be acceptable.
- e. All unacceptable conditions found during television inspection must be corrected and re-televised.

2. Gravity Sewer Lines

- a. The completed sanitary sewer shall be high-pressure water jet cleaned and subjected to a low pressure air test. In accordance with the following procedures:
 - 1) All service laterals, cleanouts, stubs and fittings within the sewer test section shall be properly capped or plugged during construction to prevent air loss that could cause an erroneous air test result.
 - 2) Plugs shall be supplied and installed by the Contractor in the line to be tested at each manhole. Each plug shall be securely placed.
 - 3) Low pressure air shall be slowly introduced into the sealed line until a constant internal pressure of 4.0 psi is maintained.
 - 4) After a constant pressure of 4.0 psi is reached, the air supply shall be throttled back to maintain that internal pressure for at least two minutes.
 - 5) After the stabilization period, the air hose from the control panel to the air supply shall be shut off or disconnected, and the test shall begin.
 - 6) For a section of the line to pass, there shall be zero leakage for a five-minute interval after the supply has been shut off.
- b. The entire length of all flexible sewers shall be tested for deflection using a "go-no-go" mandrell (95% of the pipe's internal diameter).
- c. Sewer line sections shall be visually inspected by means of a closed circuit television. The inspection shall be done one manhole section at a time and recorded on a VHS cassette.
Sewers are to be flow tested before television inspection to ensure

no ponding occurs.

- 1) The television camera used for the inspection shall be one specifically designed and constructed for such inspection. The image shall be clear enough to enable the City representative and others viewing the monitor to easily evaluate the interior condition of the pipe. The inspection shall be recorded on a VHS videocassette and the City shall retain a copy of the tape.
- 2) The visual inspection may be provided by an approved TV inspection firm or by the City. If the Developer should request this service from the City, He/she shall be charged per lineal foot inspected at the current rate.
- 3) Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall have a footage-recording device and the footage shall be displayed on the monitor.
- 4) Unacceptable conditions that adversely affect the ability of the system to function as designed or to be properly maintained may include, but are not limited to the following:
 - a) Protruding taps.
 - b) Root intrusion.
 - c) Cracked or faulty pipe.
 - d) Improper pipe repair.
 - e) Misaligned or deformed pipe.
 - f) Debris in line.
 - g) Infiltration/exfiltration.
 - h) Bellies or sags with a depth greater than or equal to 10% (or a maximum of 1-1/2 inches) of pipe diameter and/or a length greater than 25 feet.

3. Manholes - Vacuum Method

- a. Precast concrete manholes shall be tested in accordance with ASTM C 1244-93, standard test method for concrete sewer manholes by the negative air pressure test (vacuum method).
- b. Manholes shall be tested after installation with all connections in place.
- c. Procedure for testing shall be as follows:
 - 1) Temporarily plug all pipes entering the manhole at least eight inches into the sewer pipe. The plug must be inflated at a location past the manhole/pipe gasket, and braced to prevent the plugs or pipes from being drawn into the manhole.
 - 2) The test head shall be placed inside the frame at the top of the manhole and inflated, in accordance with the manufacturer's recommendations.
 - 3) A vacuum of ten inches of mercury (10" Hg) shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and shut off the pump or disconnect the vacuum line from the pump.

- 4) The pressure gauge shall be liquid filled, having a 3.5 inch diameter face with a reading from zero to 30 inches of mercury.
 - 5) The manhole is considered to pass the vacuum test if the time for the vacuum reading to drop from 10" to 9" Hg is one minute or more.
 - 6) If the manhole fails the test, necessary repairs shall be made. The vacuum test shall be repeated until the manhole passes the test.
 - 7) All temporary plugs and braces shall be removed after each test.
- d. Manholes shall show no signs of ponding water in the inverts.
4. Force Mains - Exfiltration Method
- a. All force mains shall be tested at a minimum pressure of at least 50 percent above the design operating pressure, for at least 30 minutes. Leakage shall not exceed the amount given by the following formula:

$$L = \frac{ND \sqrt{P}}{1850}$$

where: L is allowable leakage in gallons per hour
 N is the number of pipe joints
 D is the pipe diameter in inches
 P is the test pressure

5. Force Mains – Air Testing

- a. The design operating pressure of a force main is expressed as total dynamic head (tdh). (TDH is measured in feet of water. It is known that 34 feet of water equals 14.7 psi.) The project drawings shall show the TDH.
- b. The formula for obtaining the testing pressure (P) shall be:
- $$P = 0.65 (H)$$
- where P = test pressure in psi
 H = total dynamic head (tdh) in feet of water at design operating point.
- c. Specific pressure used in the test shall be subject to the approval of the City.
- d. The air test is to be conducted between the pump station and line's discharge manhole. The test equipment shall consist of:
1. Two plugs (one tapped and equipped for air inlet connection)
 2. A shut-off valve
 3. A pressure regulating valve
 4. A pressure reduction valve
 5. A monitoring pressure gauge having a pressure range of 5 psi greater than the required test pressure. The test equipment shall be set up outside the manhole or pump station for easy access to reading.
- e. Air shall be supplied slowly. When the required pressure has been reached, it shall be maintained for five minutes to insure the pipe's

internal pressure has been stabilized. After stabilization, the air supply shall be shut off and the test begun.

- f. For the section of line to pass, there shall be zero leakage for 60 minutes after the valve has been shut off.
- g. The test must be done in the presence of a City Utilities inspector.

6. Pump Station Wet Wells

- a. Pump station wet wells shall be tested by either the ex-filtration or vacuum method.

IV. As-Built Drawings

A. General

1. As-built drawings shall be submitted to the City of Winchester, Department of Public Utilities whenever the project involves a sanitary sewer, storm sewer or water main extension (either public or private).
2. As-built drawings may be required even if the project includes only water or sewer services, if a substantial change from the approved plan occurs during the construction phase of the project.
3. The developer is responsible for furnishing as-built drawings upon the completion of the sewer and water work.
4. As-built drawings must be furnished to the City of Winchester prior to the approval of connection of any building or structure to the water and sewer system.
5. As-built drawings shall show the building footprint (for site development plans) and the finished floor elevation.
6. As-built drawing submittal shall include a copy of the final plat as recorded.

B. Drawing Preparation Guidelines

1. As-built drawings must show all field changes made to the approved drawings.
2. No hand drawn or marked up construction plans will be accepted as as-built drawings.
3. The term "As-built" is to be stamped in large clear print on the Plans. A professional engineer or licensed land surveyor shall certify the Plans as As-built drawings.
4. Water and sewer as-built drawings shall be shown on separate plan sheets.
5. The as-built drawings are to be submitted on 24" x 36" paper.

C. Drawing Submittal Guidelines

1. First submittal for review shall include one set of black and white drawings on 24" x 36" paper.
2. Upon approval of the City engineer, final submittals shall include three sets of black and white drawings on 24" x 36" paper and a digital set of drawings in CAD per the digital drawing submittal guidelines below.

D. Digital Drawing Submittal Guidelines

1. As-built drawings are to be submitted in digital format in the form of AutoCAD drawings, on a CD.
2. All files shall be presented in AutoCAD format, either *.dwg or *.dxf files.
3. All files shall be referenced to the closest control point provided on the control points list (see Appendix A). These control points are stored in NAD83 Virginia State Planes, North Zone and NAVD88 coordinate systems.

4. Submitted *.dwg files should have multiple layers instead of one layer representing the entire drawing.

E. Water As-built Drawing Requirements

1. As-built drawings need to include all the information in the approved plans, including standards and details, showing all changes made, together with all the following information:
 - a. Project name and location description.
 - b. North arrow and scale.
 - c. Date construction plans approved.
 - d. Date as-built drawings prepared and by whom.
 - e. Registered Engineer's or Surveyor's certification stating that the completed facilities substantially comply with approved plans.
 - f. Land use.
 - g. Total number of lots served.
 - h. Address and lot number on each lot.
 - i. Water tap location for each lot, giving the station number or point of connection to main line.
 - j. All meter vaults shall be shown showing location of vault related to lot property corner, or alternatively by providing coordinates tied to the City's coordinate system. Meter size(s) shall be shown on the Plans.
 - k. Plan and profile views for mains and streets. Typical features that may be a part of a watermain project include pipes, hydrants, blowoffs, valves, fittings, structures, castings. Information that needs to appear on the as-built drawings for each of the aforementioned facilities includes finished grades (street and/or ground), quantities, material, manufacturer and/or source, dated completed, date inspected, public vs. private facilities.
 - l. Easements with dimensions, identifying allowable use.
 - m. Portions encased in concrete where crossing other pipes.
 - n. Developer information including:
 - 1) Developer's corporate name.
 - 2) Primary contact.
 - 3) Mailing address.
 - 4) Telephone Number.
 - o. Design Engineer and/or Surveyor information including:
 - 1) Designer's corporate name.
 - 2) Mailing address.
 - 3) Telephone number.
 - 4) Virginia Registration number.
 - 5) Certification that the construction was completed in compliance with the Approved Construction Drawings.
 - p. Contractor's information including:
 - 1) All contractor's that worked on the project.

- 2) Field superintendents.
- 3) Facilities constructed.
- 4) Contractor's address.
- 5) Contractor's telephone numbers.

F. Sanitary Sewer As-Built Drawing Requirements

1. As-built drawings need to include all the information in the approved plans, including standards and details, showing all changes made, together with all the following information:
 - a. Project name and location description.
 - b. North arrow and scale.
 - c. Date construction plans approved.
 - d. Date as-built drawings prepared and by whom.
 - e. Registered Engineer's or Surveyors's certification stating that the completed facilities substantially comply with approved plans.
 - f. Land use.
 - g. Total number of lots served.
 - h. Address and lot number on each lot.
 - i. Sanitary sewer lateral location for each lot, giving the station number or point of connection to main line.
 - j. The following detail dimensions shall be given for each sewer lateral:
 - 1) Length of lateral from main to lateral plug.
 - 2) Depth of lateral at property line.
 - 3) Dimension from property corner to lateral location, or alternatively by providing coordinates tied to the City's coordinate system.
 - k. Plan and profile views for sewers and streets. Typical features that may be part of a sanitary sewer project include: pipes, structures (manholes), castings, pump stations, force mains. Information that needs to appear on the as-built drawings for each of the aforementioned facilities includes: rim and invert elevations, slopes, dimensions, quantities, materials, manufacturer and/or source, date completed, date inspected, public vs. private facilities.
 - l. Easements with dimensions, identifying allowable use.
 - m. Portions encased in concrete where crossing other pipes.
 - n. Developer information including:
 - 1) Developer's corporate name.
 - 2) Primary contact.
 - 3) Mailing address.
 - 4) Telephone Number.
 - o. Design Engineer and/or Surveyor information including:
 - 1) Designer's corporate name.
 - 2) Mailing address.
 - 3) Telephone number.
 - 4) Virginia Registration number.

- 5) Certification that construction was completed in compliance with the Approved Construction Drawings.

p. Contractor's information including:

- 1) All contractor's that worked on the project.
- 2) Field superintendents.
- 3) Facilities constructed.
- 4) Contractor's address.
- 5) Contractor's telephone numbers.

G. Storm System As-Built Drawing Requirements

1. As-built drawings need to include all the information in the approved plans, including standards and details, showing all changes made, together with all the following information:
 - a. Project name and location description.
 - b. North arrow and scale.
 - c. Date construction plans approved.
 - d. Date as-built drawings prepared and by whom.
 - e. Registered Engineer's or Surveyors's certification stating that the completed facilities substantially comply with approved plans.
 - f. Plan and profile views for sewers and streets. Typical features that may be part of a storm sewer project include: pipes, structures (manholes), castings. Information that needs to appear on the as-built drawings for each of the aforementioned facilities includes: rim and invert elevations, slopes, dimensions, quantities, materials, manufacturer and/or source, date completed, date inspected, public vs. private facilities.
 - g. Easements with dimensions, identifying allowable use.
 - h. Profile, elevations along centerline of ditches.
 - i. Detention Ponds - refer to the Winchester City Code, Section 9-4 "Erosion and Sedimentation Control Plan."
 - j. Developer information including:
 - 5) Developer's corporate name.
 - 6) Primary contact.
 - 7) Mailing address.
 - 8) Telephone Number.
 - k. Design Engineer and/or Surveyor information including:
 - 6) Designer's corporate name.
 - 7) Mailing address.
 - 8) Telephone number.
 - 9) Virginia Registration number.
 - 10) Certification that construction was completed in compliance with the Approved Construction Drawings.

l. Contractor's information including:

- 6) All contractor's that worked on the project.
- 7) Field superintendents.
- 8) Facilities constructed.
- 9) Contractor's address.
- 10) Contractor's telephone numbers.

V. Project Acceptance of Work

Public Improvements

A. Substantial Completion

1. A substantial completion for water and sewer will be issued when:
 - a. All approved materials have been installed per the City's requirements.
 - b. The completed work has been inspected and the system is in working order. The City of Winchester reserves the right to reject all or any portion of the facilities if construction standards have not been met.
 - c. The appropriate tests have been successfully completed.
 - d. The sewer mains have been flushed and cleaned prior to video taping.
 - e. The video inspection of the project's sewer lines have been received and reviewed.
 - f. As-built information has been submitted to and approved by the Public Utilities Department. As-built information must be submitted in both paper and digital (AutoCAD) format. Information submitted shall include the project name and description, location, quantities of pipe, manholes, valves, hydrants, etc., and cost of facilities installed.
 - g. A Deficiency and Omissions list has been issued to the Owner and Contractor. The Deficiency and Omissions list will be based on findings by the inspector when the Contractor has requested an inspection of the facilities. The inspection will include, but may not be limited to, the items noted on the checklist in Appendix A
2. The Owner and Contractor shall be notified of substantial completion in writing.

B. Final Acceptance

1. A project will be accepted when:
 - a. The items on the Deficiency and Omissions list have been corrected.
 - b. Any work that has was accepted at substantial completion, but later damaged, has been repaired.
 - c. The City of Winchester Public Utilities Department has received a copy of the recorded easements with plats.
 - d. As-built drawings have been submitted and approved.
 - e. The Owner has formally dedicated the facilities to the City of Winchester and has requested the City to maintain said facilities.
2. The Owner and Contractor will be notified of final acceptance in writing.
3. Acceptance of all lines and appurtenances is subject to final inspection.
4. Until a letter of final acceptance has been issued, all materials and workmanship are the responsibility of the Owner/Developer.

C. Warranty

1. The Developer will be responsible for any maintenance as a result of construction or material defects of said facilities for one year from the date of final acceptance

Additional Conditions

A. Issuance of Land Disturbance Permit (for individual lots within a subdivision)

1. A Land Disturbance Permit is required for lots within a subdivision prior to issuance of a Building Permit.
2. Prior to issuance of a Land Disturbance Permit for an individual lot within a subdivision, the following conditions must be met:
 - a. Water mains must be installed, and must have passed both the hydrostatic and bacterial tests required in the City Standards. The main must be in service and the fire hydrants operational (note that services must be installed to the meter pit during testing).
 - b. The sanitary sewer must be installed and must have passed the air test, the mandrell test and the television inspection required in the City Standards. Manholes must have passed the vacuum testing required.
 - c. The storm sewer system must be completely installed and ready for inspection.
 - d. The street must have curb and gutter, as well as driveway turnouts installed (if required by the approved plans). Backfill must be in place behind the curbing. The gravel base must be installed to the required depth and compacted to specifications. The roadway must be passable for emergency vehicles to access the properties.
 - e. Gravel must be mounded up around manholes and valves and the structures must be marked otherwise to clearly show their locations.
 - f. Erosion and sediment control measures shall be in place as required by the approved subdivision plans.
 - g. Facility inspection must be complete (see Facility Inspection Checklist, Appendix B).
 - h. As-built drawings must be submitted for review.

B. Release of water meters

1. Before water meters are released and set, the following conditions must be met:
 - a. All conditions set forth in section C above, Issuance of Land Disturbance Permit, must be met. Exceptions may be made as set forth in Section 3-5 of the Subdivision Ordinance, Deferred Installment of Public Improvements.
 - b. Streets must be surfaced with base-course asphalt.
 - c. Lots must be at final grade.
 - d. Sanitary cleanouts and water meter pits must be set at grade.
 - e. All items on punchlist must be complete.

C. Issuance of Certificate of Occupancy

1. Before a certificate of occupancy is issued, the following conditions must be met:
 - a. All conditions set forth in section C, Issuance of Land Disturbance Permits, and section D, Release of Water Meters, must be met.
 - b. All public improvements must be complete, except for those covered in Section 3-5 of the Subdivision Ordinance, Deferred Installment of Public Improvements.
 - c. Lots must be stabilized.

APPENDIX A

DIGITAL DRAWING CONTROL POINTS

Ground Control Points

Ground control points for the City of Winchester, Virginia consists of twenty-four (24) horizontal/vertical points with only three (3) being vertical points. The control point coordinates are NAD83 Virginia State Planes, North Zone and NAVD88.

STATION NAME	NAD83 (FT) NORTHING (VA NORTH)	NAD83 (FT) EASTING (VA NORTH)	NAVD83 (FT) VERTICAL ELEVATION	DESCRIPTION
SEC2	7091437.533	11570363.591	752.04	PANEL-IRON PIN-STEPHENS CITY 2
V001			741.42	END OF GUIDE RAIL
V002	7092905.034	11565787.342	795.74	CORNER CONCRETE & PAVEMENT
V003	7099807.691	11565521.761	811.28	CORNER PARKING LOT
V004	7098284.779	11569846.964	753.82	CORNER SIDEWALK
V005	7099122.529	11575616.794	743.05	S.E. CORNER CONCRETE PAD
V006	7105292.075	11562613.294	807.44	FENCE CORNER
V007	7106226.773	11568840.924	806.32	CORNER CONCRETE & PAVEMENT
V008	7106543.286	11572129.841	750.18	CORNER CONCRETE & PAVEMENT
V009	7105238.620	11581431.041	714.53	CORNER CONCRETE & PAVEMENT
V010			714.02	EDGE OF ROAD OPPOSITE OF GATE POST
V011	7117167.856	11564458.581	859.40	CORNER PAVEMENT & CONCRETE
V012	7116818.946	11567138.648	805.36	CORNER CONCRETE SIDEWALK
V013	7116590.620	11572845.431	772.01	CORNER CONCRETE SIDEWALK
V014	7115665.288	11577539.786	718.29	CORNER SIDEWALK CHANGE
V015	7119945.398	11582172.716	701.72	CORNER CONCRETE SLAB
V016	7120122.125	11586131.832	695.60	CORNER END CONCRETE SIDEWALK
V017			866.21	BASE OF CORNER FENCE /GATE POST
V018	7126623.859	11567193.093	874.73	N.E. CORNER OF STONEWALL
V019	7126641.484	11573856.564	830.27	CORNER PARKING LOT
V020	7127282.596	11576642.241	765.95	N.E. CORNER CONCRETE PAD
V021	7126910.522	11582466.313	713.52	CORNER CONCRETE CURB APRON
WIN1	7112482.453	11586551.918	664.56	PANEL-IRON PIN WINCHESTER 1
WIN2	7127296.368	11586730.436	702.49	PANEL-IRON PIN WINCHESTER 2
WIN3	7127360.257	11564080.104	848.36	PANEL-IRON PIN WINCHESTER 3
WIN4	7095385.741	11563105.266	782.94	PANEL-IRON PIN WINCHESTER 4
WIN5	7107419.678	11576832.739	694.59	PANEL-IRON PIN WINCHESTER 5

APPENDIX B

FACILITY INSPECTION CHECKLIST

FACILITIES INSPECTION

Project: _____
Date of Inspection: ____/____/20____
Inspector: _____

FACILITY1. WATER

a. Water Main

☐ Testing complete and passed?
Hydrostatic, bacteriologic

b. Water Meter(s)

☐ Exterior condition
☐ Depth on angle valve
☐ Cleanliness
☐ Traffic rated lids, if in driveway
☐ Location? Between curb and sidewalk or directly behind sidewalk

c. Water Valve Boxes

☐ Condition
☐ Workability
☐ Stem depth
☐ Skid pads

d. Fire Hydrants

☐ Height of breakaway flange correct?

2. SANITARY SEWER

a. Sanitary Sewer Main

☐ Testing complete and passed? Air test, TV, mandrel, manhole vacuum tests

b. Manholes

☐ Clean
☐ Inverts
☐ Parging

c. Sanitary Sewer Cleanouts

☐ Accessible
☐ Location? Between curb and sidewalk or directly behind sidewalk
☐ Traffic rated lids, if in driveway

3. STORMWATER & EROSION AND SEDIMENT CONTROL

a. Storm Sewer Main

- ☐ Properly installed?
- ☐ End sections and outlet protection as required?

b. Structures (Manholes & Inlets)

- ☐ Condition
- ☐ Inverts
- ☐ Paving
- ☐ Cleanliness
- ☐ Does length of inlet match plans?

c. Erosion & Sediment Controls

- ☐ Inlet protection as necessary
- ☐ Permanent/temporary seeding?

d. Grading

- ☐ Ditches in place and stabilized
- ☐ Water quality swales installed?

4. STREETS

a. Curb & Gutter & Sidewalks

- ☐ Completely installed
- ☐ Condition
- ☐ Clean

b. Road Surface

- ☐ Final surface installed
 - ☐ Condition (clean, smooth?)
 - ☐ Backfilled behind curb and right-of-way stabilized
 - ☐ Street signs and traffic signs installed
 - ☐ Street lights installed and operational
 - ☐ Proof rolled and passed?
- Compaction testing if applicable

5. OTHER SPECIAL FEATURES

- ☐ Walking/bike paths
- ☐ _____
- ☐ _____
- ☐ _____

6. AS-BUILT DRAWINGS

- ☐ Received and satisfactory
- ☐ Three (3) sets plus electronic version

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

TYPICAL METER SETTING INCLUDES:

5/8" X 3/4" METER SUPPLIED BY THE CITY OF WINCHESTER

YOKE INLET VALVE - FORD MODEL BA94-223W, AY MCDONALD

4642BY-22 3/4x5/8x02

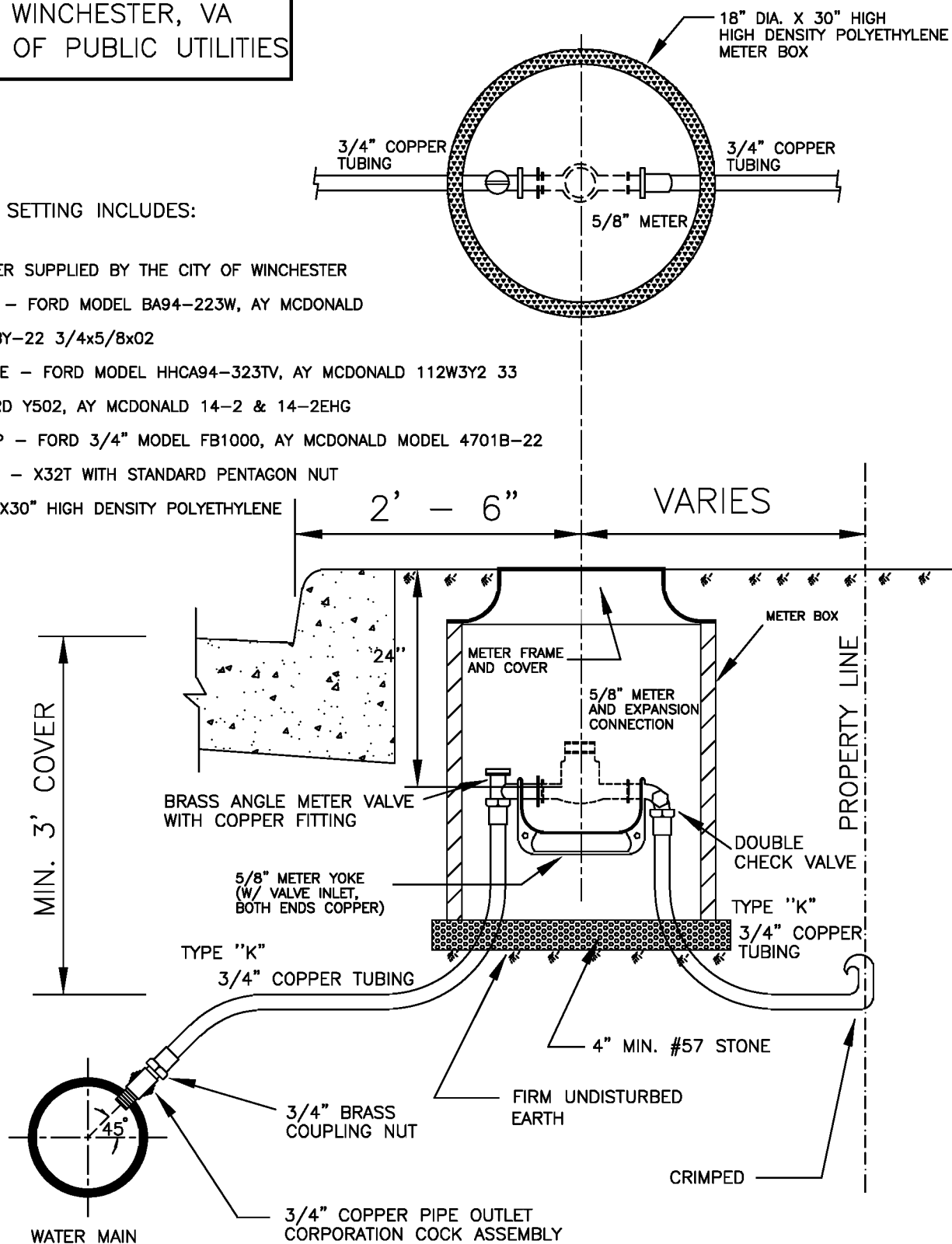
YOKE OUTLET VALVE - FORD MODEL HHCA94-323TV, AY MCDONALD 112W3Y2 33

YOKE BARS - FORD Y502, AY MCDONALD 14-2 & 14-2EHG

CORPORATION STOP - FORD 3/4" MODEL FB1000, AY MCDONALD MODEL 4701B-22

METER BOX COVER - X32T WITH STANDARD PENTAGON NUT

METER BOX - 18"X30" HIGH DENSITY POLYETHYLENE



STANDARD
DETAIL NO.
WD- 1

TYPICAL RESIDENTIAL WATER SERVICE
5/8" x 3/4"
SCALE: NONE

DATE: 4/05

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

TYPICAL METER SETTING INCLUDES:

- 1 - "U" BRANCH FORD MODEL U48-437.5
- 2 - 5/8" X 3/4" METERS SUPPLIED BY THE CITY OF WINCHESTER

YOKE INLET VALVE - FORD MODEL BA91-223W, AY MCDONALD

4642BY-22 3/4x5/8x02

YOKE OUTLET VALVE - FORD MODEL HHCA94-323TV, AY MCDONALD 112W3Y2 33

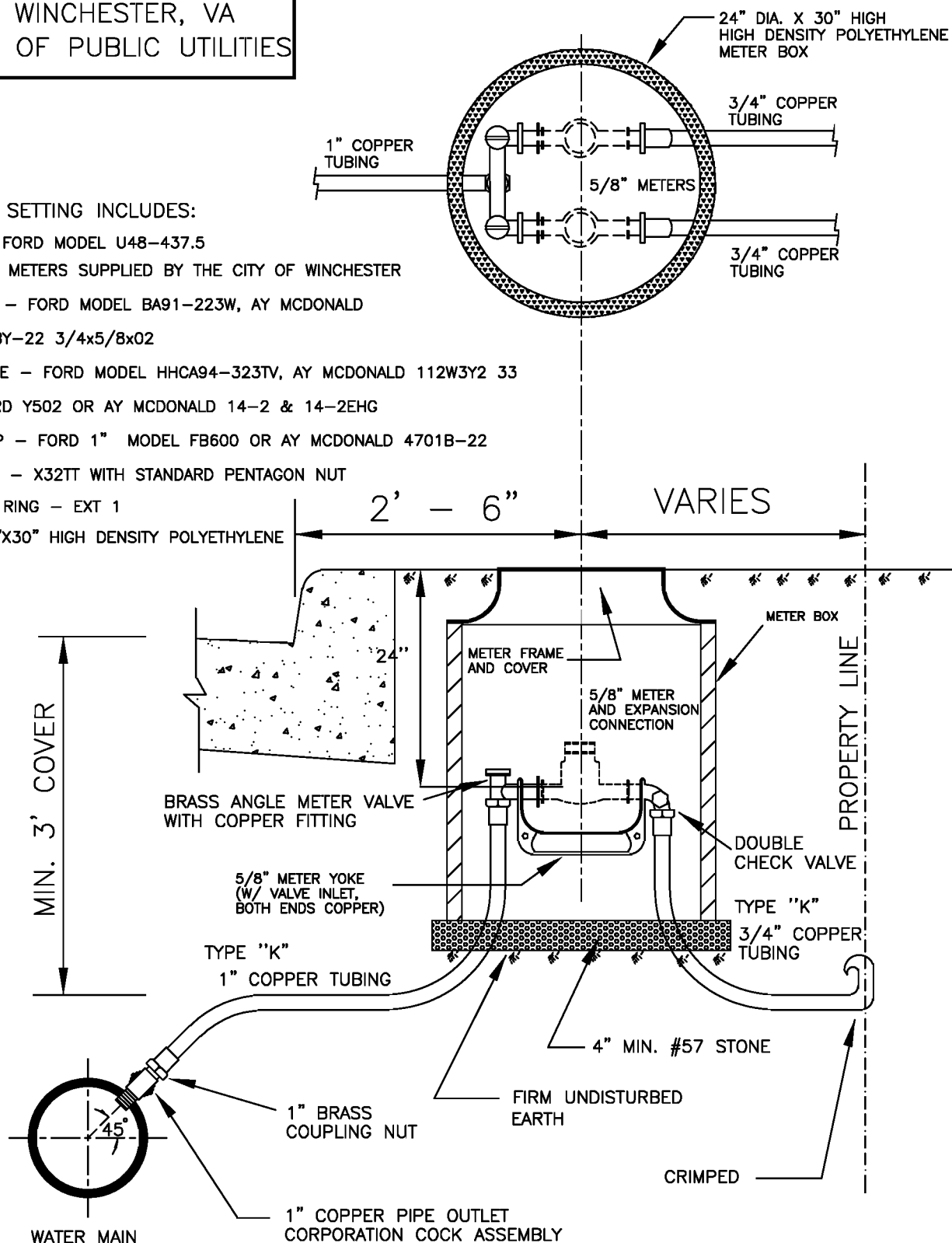
YOKE BARS - FORD Y502 OR AY MCDONALD 14-2 & 14-2EHG

CORPORATION STOP - FORD 1" MODEL FB600 OR AY MCDONALD 4701B-22

METER BOX COVER - X32TT WITH STANDARD PENTAGON NUT

COVER EXTENSION RING - EXT 1

METER BOX - 24"x30" HIGH DENSITY POLYETHYLENE



STANDARD
DETAIL NO.
WD- 2

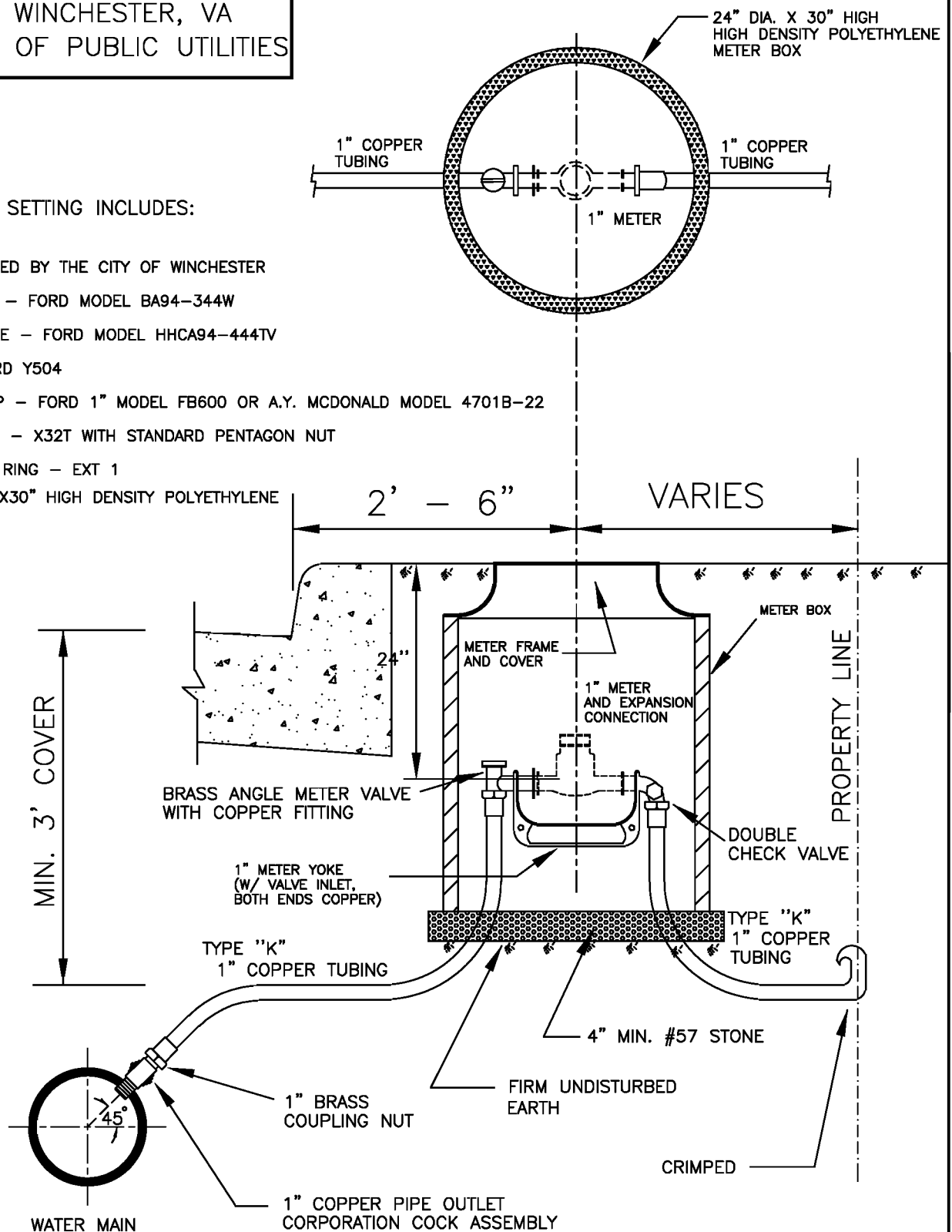
TYPICAL RESIDENTIAL WATER SERVICE
TWIN SETTING 5/8" x 3/4"
SCALE: NONE

DATE: 4/05

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

TYPICAL METER SETTING INCLUDES:

1" METER SUPPLIED BY THE CITY OF WINCHESTER
 YOKE INLET VALVE - FORD MODEL BA94-344W
 YOKE OUTLET VALVE - FORD MODEL HHCA94-444TV
 YOKE BARS - FORD Y504
 CORPORATION STOP - FORD 1" MODEL FB600 OR A.Y. MCDONALD MODEL 4701B-22
 METER BOX COVER - X32T WITH STANDARD PENTAGON NUT
 COVER EXTENSION RING - EXT 1
 METER BOX - 24"x30" HIGH DENSITY POLYETHYLENE



STANDARD
DETAIL NO.
WD- 3

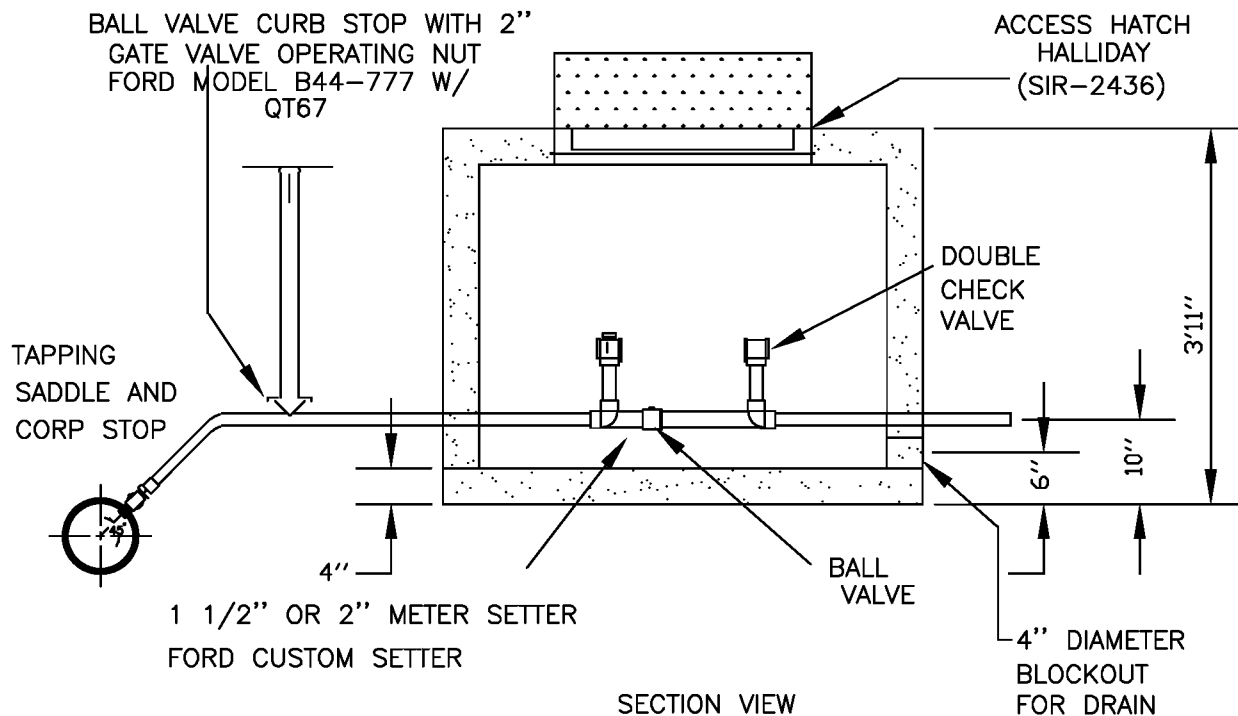
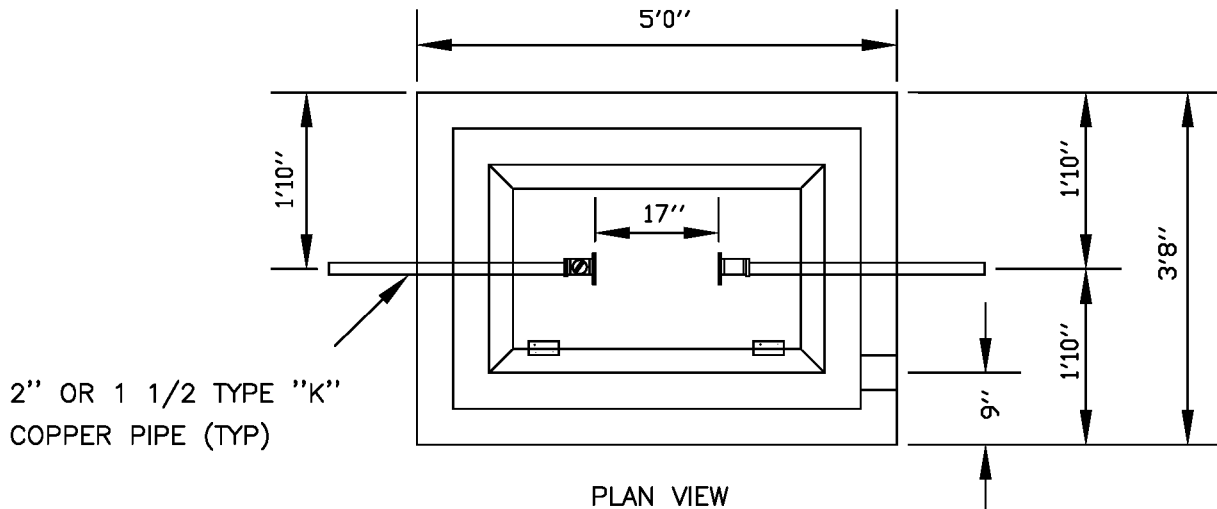
TYPICAL 1 INCH WATER SERVICE
SCALE: NONE

DATE: 4/05

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

* 2" FORD COPPERSETTER MODEL # VBHH77-15BHC-11-77
* 1-1/2 FORD: SAME LAYING DISTANCE
AS 2" WITH ONE PAIR OF 2" x 1-1/2"
METER ADAPTERS, FORD
PART # A67

- * METER SUPPLIED BY THE DEPARTMENT OF PUBLIC UTILITIES
- * FLANGED ANGLE METER VALVE SHALL HAVE "O"
- RING TYPE FLANGE METER SUPPORT BRACKETS
- * BACK FLOW DEVICE REQUIRED AS SET FORTH IN CITY CROSS
CONNECTION CONTROL PROGRAM
- * BACKFLOW DEVICE MAY NOT BE INSTALLED IN METER VAULT
- * METER SETTING TO BE FORD CUSTOM SETTER OR APPROVED EQUAL
- * PRECAST VAULT AS MANUFACTURED BY THE CLEAR FLOW
COMPANY OF WAYNESBORO, VA OR APPROVED EQUAL



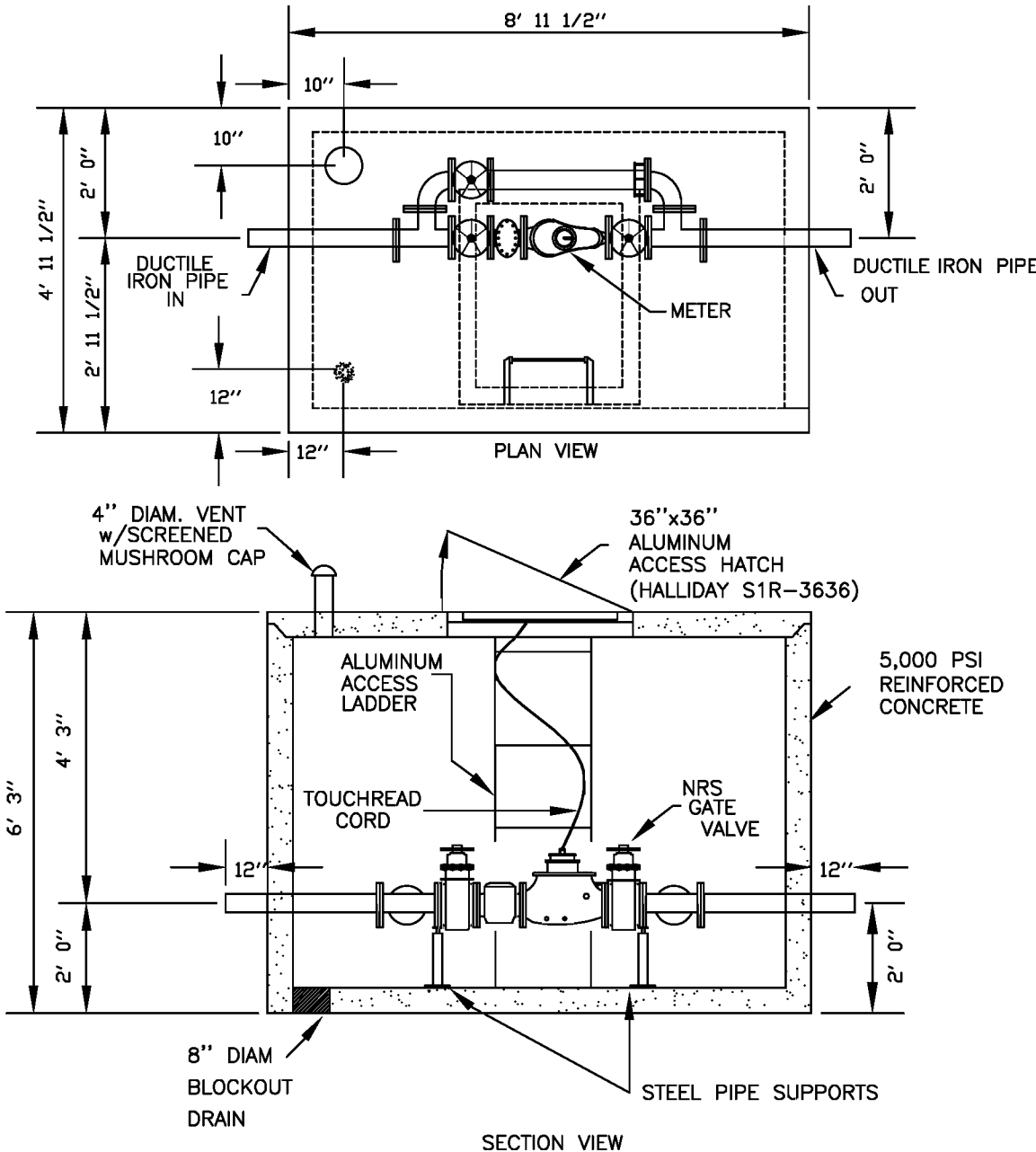
STANDARD
DETAIL NO.
WD- 4

1 1/2" & 2" METER INSTALLATION
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

- 1) PRECAST VAULT BY THE CLEAR FLOW CO. OF WAYNESBORO, VA OR APPROVED EQUAL.
- 2) METER SHALL BE FURNISHED BY THE DEVELOPER AND APPROVED BY THE DEPARTMENT OF UTILITIES.
- 3) ALL FITTINGS SHALL BE MECHANICAL JOINT.
- 4) SUBBASE UNDER THE VAULT SHALL BE A MINIMUM OF 6" VDOT #57 STONE.



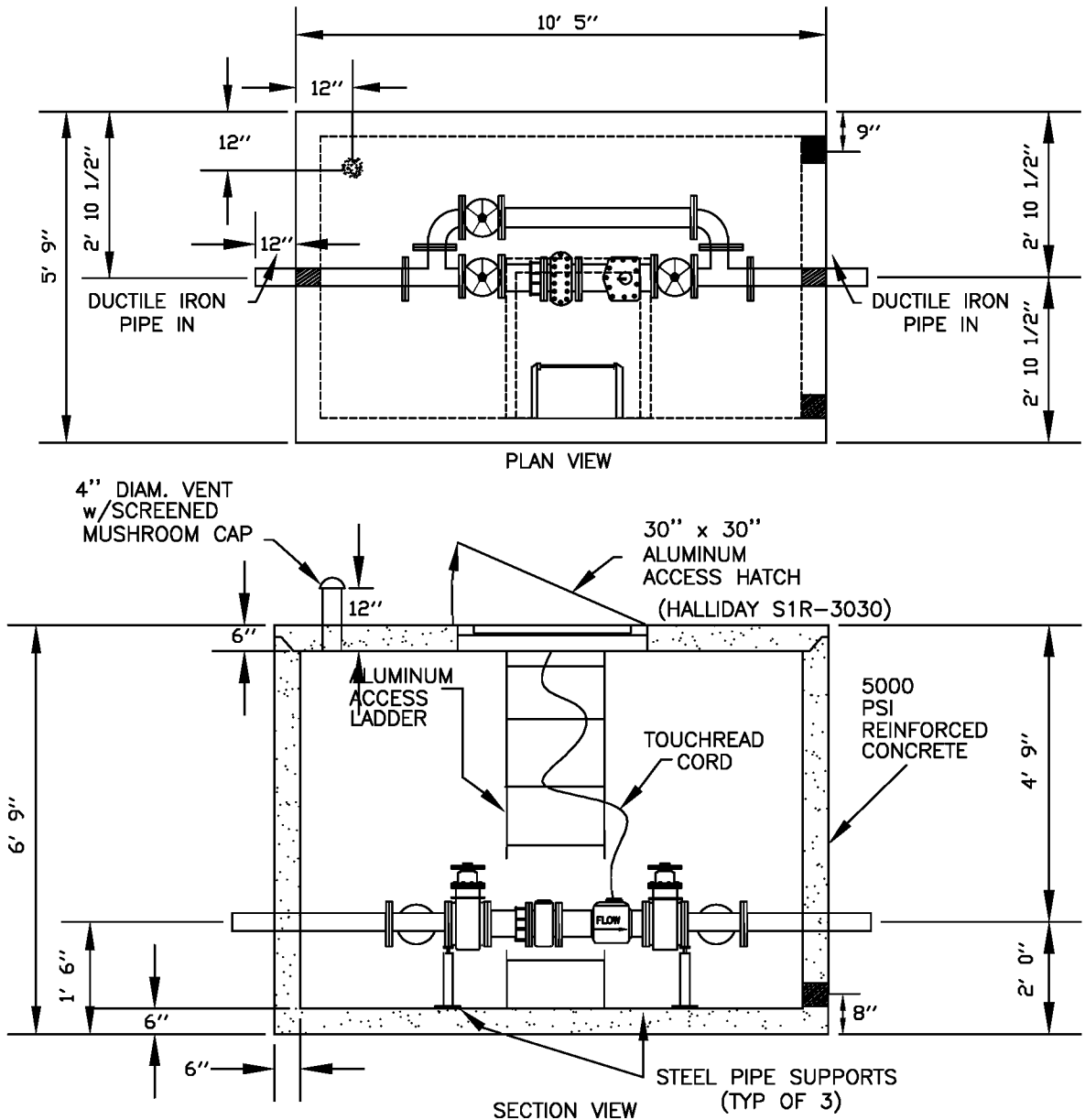
STANDARD
DETAIL NO.
WD- 5

TYPICAL COMPOUND METER SERVICE
INSTALLATION AND VAULT DETAIL
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

- 1) PRECAST VAULT BY THE CLEAR FLOW CO. OF WAYNESBORO, VA OR APPROVED EQUAL.
- 2) METER SHALL BE FURNISHED BY THE DEVELOPER AND APPROVED BY THE DEPARTMENT OF UTILITIES.
- 3) ALL FITTINGS SHALL BE MECHANICAL JOINT.
- 4) SUBBASE UNDER THE VAULT SHALL BE A MINIMUM OF 6" VDOT #57 STONE.
- 5) VAULT DIMENSIONS GIVEN ARE THE MINIMUM ALLOWED AND ARE SUBJECT TO CHANGE TO ACCOMMODATE LARGER SIZE METER



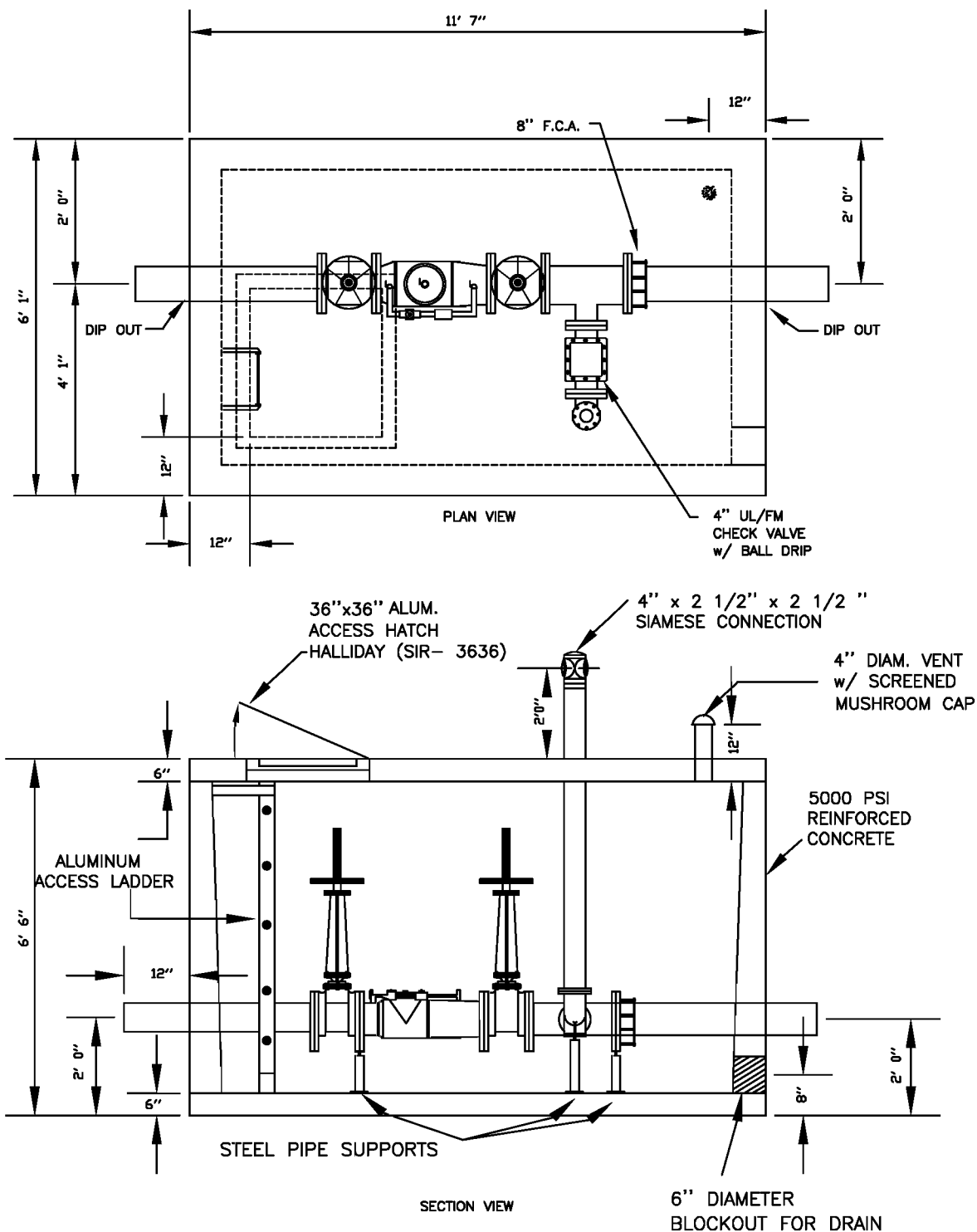
STANDARD
DETAIL NO.
WD-6

TYPICAL SINGLE JET METER SERVICE
INSTALLATION AND VAULT DETAIL
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

PRECAST VAULT BY THE CLEAR FLOW CO. OR APPROVED EQUAL.
AMES DOUBLE DETECTOR CHECK W/ METERED BYPASS OR EQUAL.
SUBBASE UNDER VAULT SHALL BE A MINIMUM 6" VDOT #57 STONE.



STANDARD
DETAIL NO.
WD- 7

FIRE LINE SERVICE INSTALLATION
SCALE: NONE

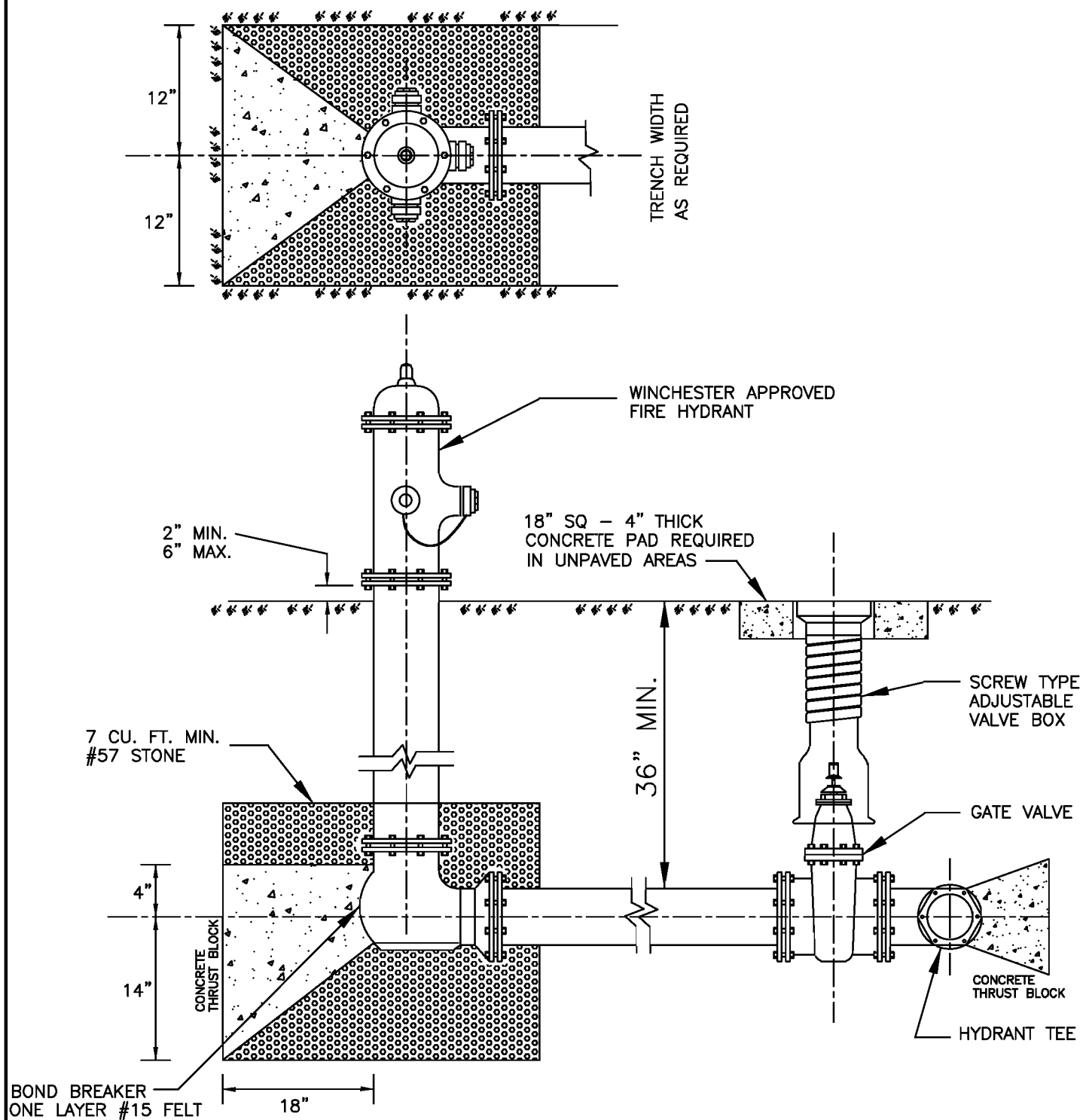
DATE: 4/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

FIRE HYDRANT SHALL BE TRAFFIC MODEL

RESTRAINTS SHALL BE BY MEGA-LUG FLANGES

4 - 1/2" STREAMER NOZZLE SHALL FACE THE ROADWAY



STANDARD
DETAIL NO.
WD- 8

FIRE HYDRANT INSTALLATION
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

TYPICAL RESILIENT SEAT VALVE INSTALLATION:

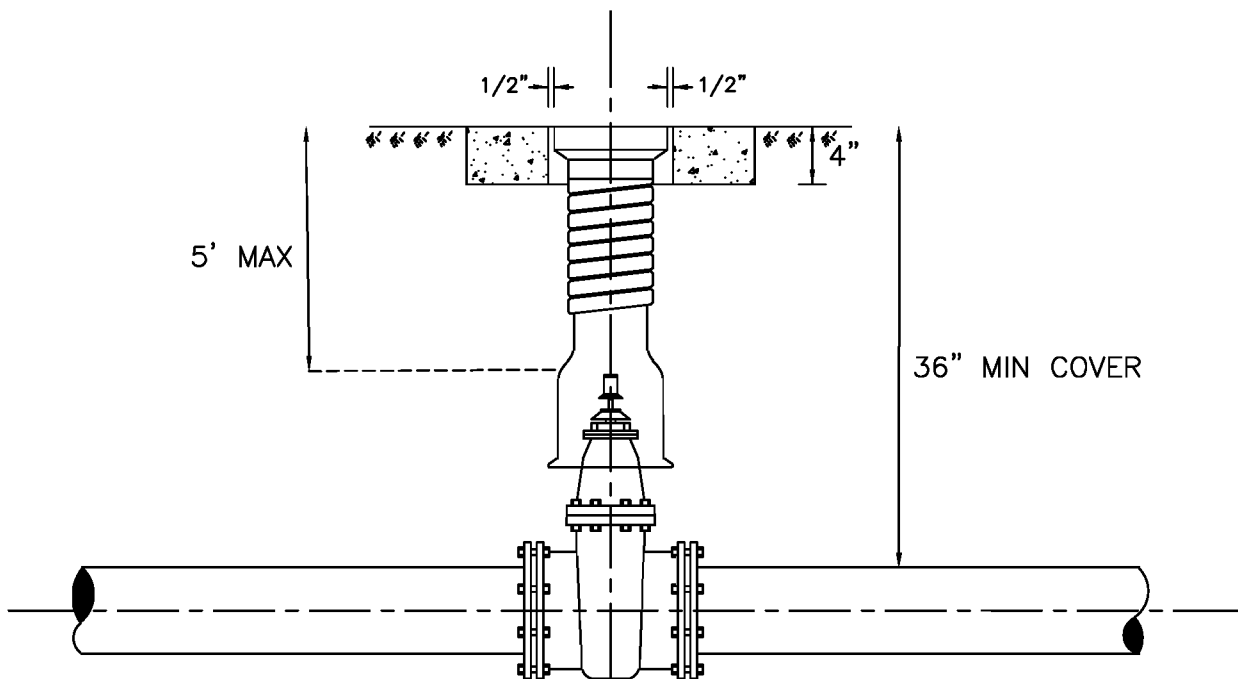
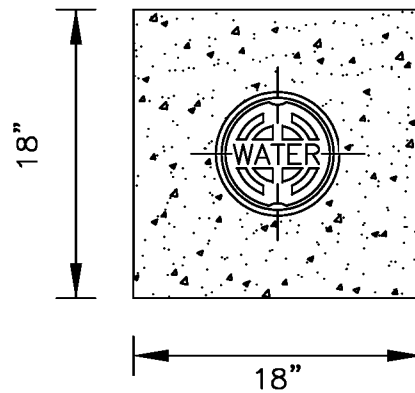
VALVE BOX AND BOOT SHALL BE CAST IRON

VALVE BOX COVER SHALL BE MARKED "WATER"

VALVE TOP SHALL BE FLUSH WITH FINISHED GRADE

18" X 18" CONCRETE PAD SHALL BE PLACED AROUND
VALVE BOXES LOCATED OUTSIDE OF PAVEMENT AREAS

VALVE BOX SHALL BE SCREW TYPE FOR ADJUSTMENT



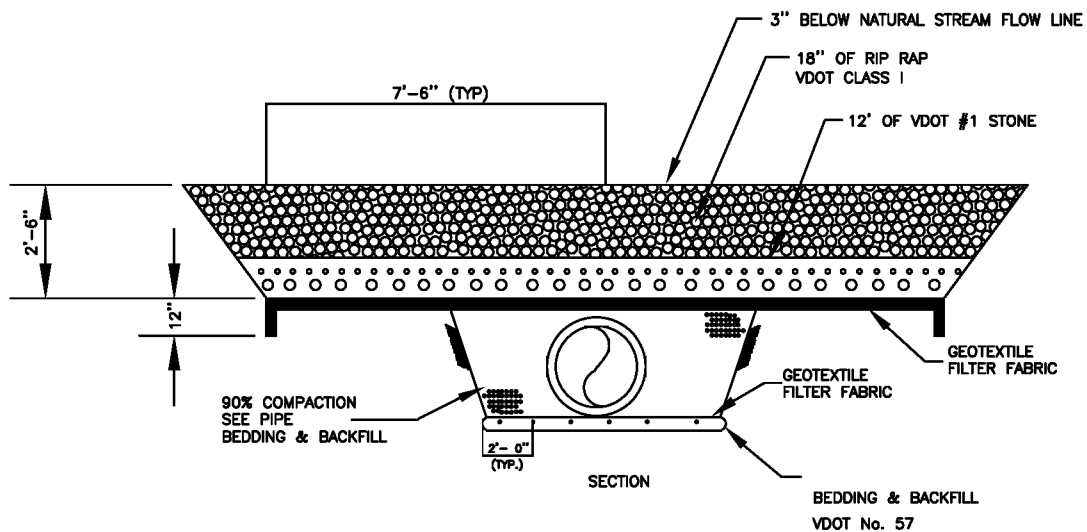
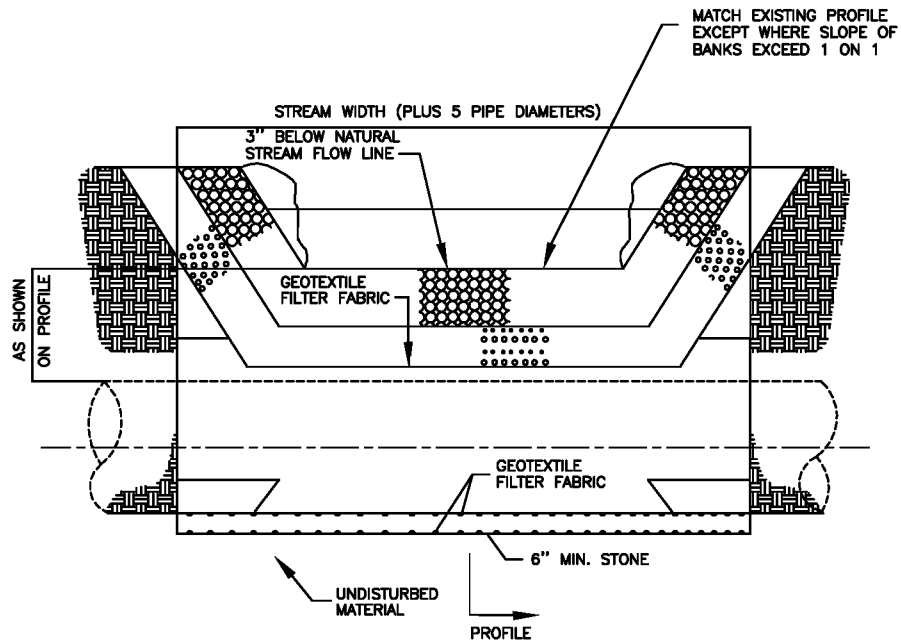
MECHANICAL JOINT FITTINGS AND PIPE RESTRAINED
BY USING MEGA-LUG RESTRAINING FLANGES

STANDARD
DETAIL NO.
WD- 9

TYPICAL VALVE & BOX INSTALLATION
SCALE: NONE

DATE: 12/03

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES



STANDARD
DETAIL NO.
WD- 10

TYPICAL STREAM RESTORATION
SCALE: NONE

DATE: 9/01

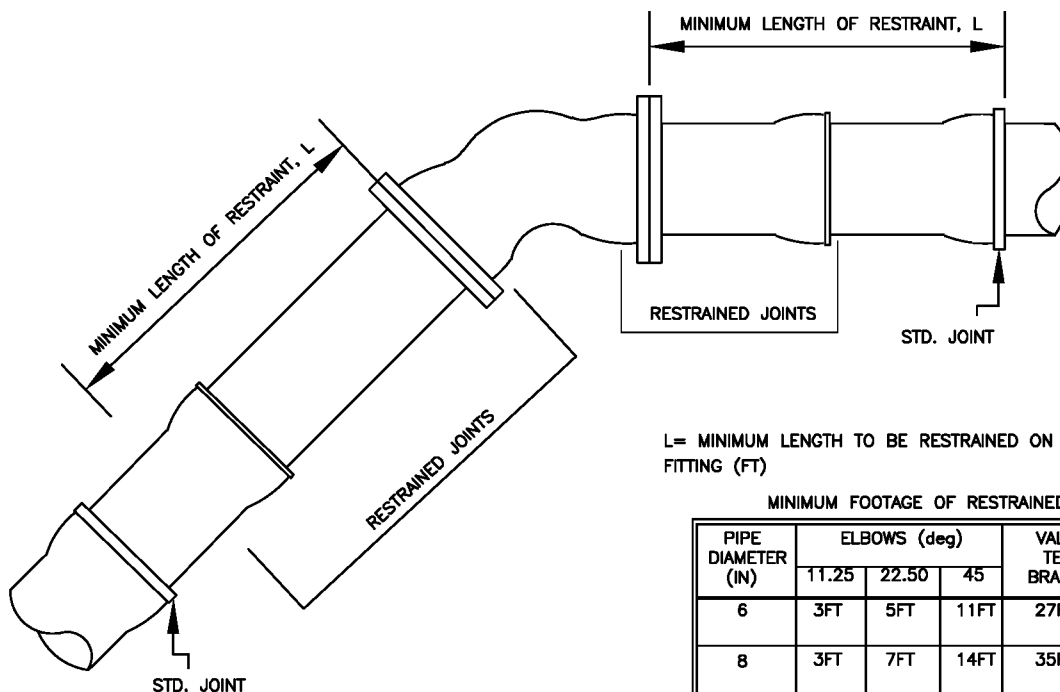
CITY OF WINCHESTER, VA DEPARTMENT OF PUBLIC UTILITIES

* THE FOLLOWING JOINTS MUST BE RESTRAINED IN ALL APPLICATION:

1. BEND— INLET & OUTLET
2. TEE— ALL BRANCHES
3. OFFSETS— INLET AND OUTLET
4. CAPS
5. PLUGS
6. DEAD ENDS
7. HYDRANT RUNOUTS SHALL BE RESTRAINED AS DEAD

* THRUST RESTRAINT ON SLIP JOINT DUCTILE IRON PIPE SHALL BE U.S. PIPE FIELD LOCK LOCK GASKETS FOR TYTON JOINT PIPE OR APPROVED EQUAL

* THRUST RESTRAINT ON DUCTILE IRON FITTINGS SHALL BE PROVIDED BY THE USE OF MEGALUG RETAINER (OR APPROVED EQUAL) AND MECHANICAL JOINT FITTINGS



L = MINIMUM LENGTH TO BE RESTRAINED ON EACH SIDE OF FITTING (FT)

MINIMUM FOOTAGE OF RESTRAINED PIPE

PIPE DIAMETER (IN)	ELBOWS (deg)			VALVE, TEES, BRANCHES	DEAD END
	11.25	22.50	45		
6	3FT	5FT	11FT	27FT	41FT
8	3FT	7FT	14FT	35FT	52FT
10	4FT	8FT	17FT	42FT	63FT
16	6FT	13FT	27FT	66FT	99FT
20	8FT	16FT	34FT	81FT	122FT
24	9FT	19FT	40FT	96FT	144FT

* FIGURES BASED ON 36 INCH BURIAL DEPTH 150 PSI TEST PRESSURE

*FIGURES BASED ON SOIL BEARING CAPACITY OF 1500 PSF

*FIGURES BASED ON LAYING CONDITION AS SPECIFIED IN THE WINCHESTER STANDARD DETAILS

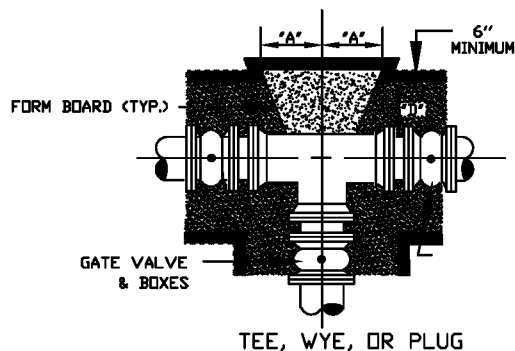
*FIGURES DO NOT APPLY TO POLY WRAPPED PIPE

STANDARD
DETAIL NO.
WD- 11

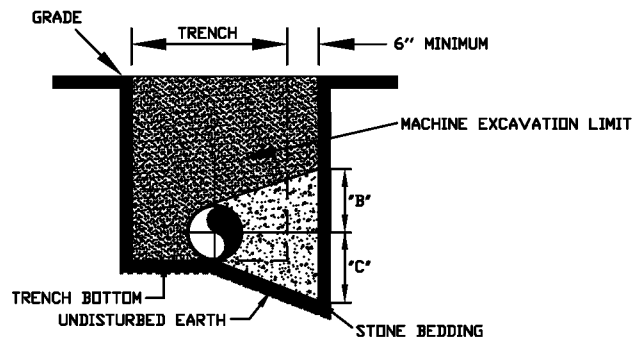
DUCTILE IRON PIPE RESTRAINT
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES



IN LIEU OF WOOD FORMING THE FITTING MAY BE WRAPPED WITH POLYETHYLENE, AND THE CONCRETE POURED TO COMPLETELY SURROUND THE FITTINGS AND AGAINST UNDISTURBED SOIL. THE BEARING DIMENSIONS AGAINST UNDISTURBED SOIL SHALL REMAIN AS SHOWN.

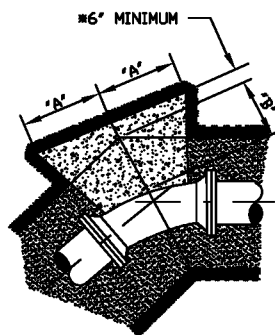


TYPICAL SECTION

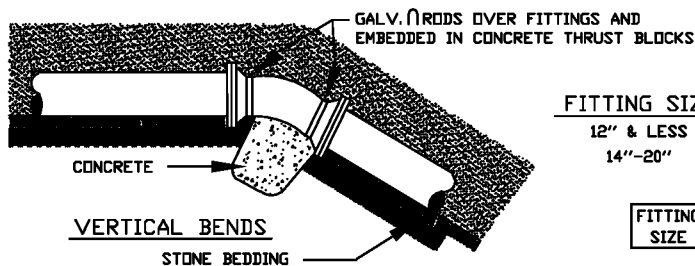
*DENOTES HAND EXCAVATION
"D" = 12" MIN. FOR 10" AND SMALLER PIPE
"D" = 18" MIN. FOR 12" THRU 20" PIPE
SEE CHART BELOW FOR A,B,C DIMENSIONS.

CONCRETE DIMENSIONS FOR HORIZONTAL THRUST BLOCKS

PIPE DIA.	PLUGS, WYES & TEES			11 1/4° AND 22 1/2° BENDS			45° AND 90° BENDS		
	A	B	C	A	B	C	A	B	C
6"	1'-0"	0'-9"	1'-0"	0'-9"	0'-9"	0'-9"	1'-3"	0'-9"	1'-9"
8"	1'-3"	0'-9"	1'-3"	0'-9"	0'-9"	0'-9"	1'-6"	0'-9"	2'-3"
10"	1'-6"	0'-9"	1'-6"	1'-0"	0'-9"	1'-3"	1'-9"	0'-9"	2'-6"
12"	1'-9"	1'-0"	2'-6"	1'-3"	1'-0"	1'-6"	2'-0"	1'-0"	3'-0"
14"	2'-0"	1'-0"	3'-0"	1'-3"	1'-0"	1'-6"	2'-6"	1'-0"	4'-0"
16"	2'-3"	1'-0"	3'-6"	1'-6"	1'-0"	2'-0"	2'-9"	1'-0"	4'-6"
18"	2'-6"	1'-3"	3'-9"	1'-6"	1'-3"	2'-0"	3'-0"	1'-3"	4'-9"
20"	2'-9"	1'-6"	4'-0"	1'-9"	1'-6"	2'-0"	3'-3"	1'-6"	5'-0"



11 1/4 THRU 90° BENDS



THRUST BLOCKS FOR VERTICAL UP BENDS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.

FITTING SIZE	ROD SIZE	NO. RODS	EMBEDMENT
12" & LESS	6	2	30"
14"-20"	8	2	36"

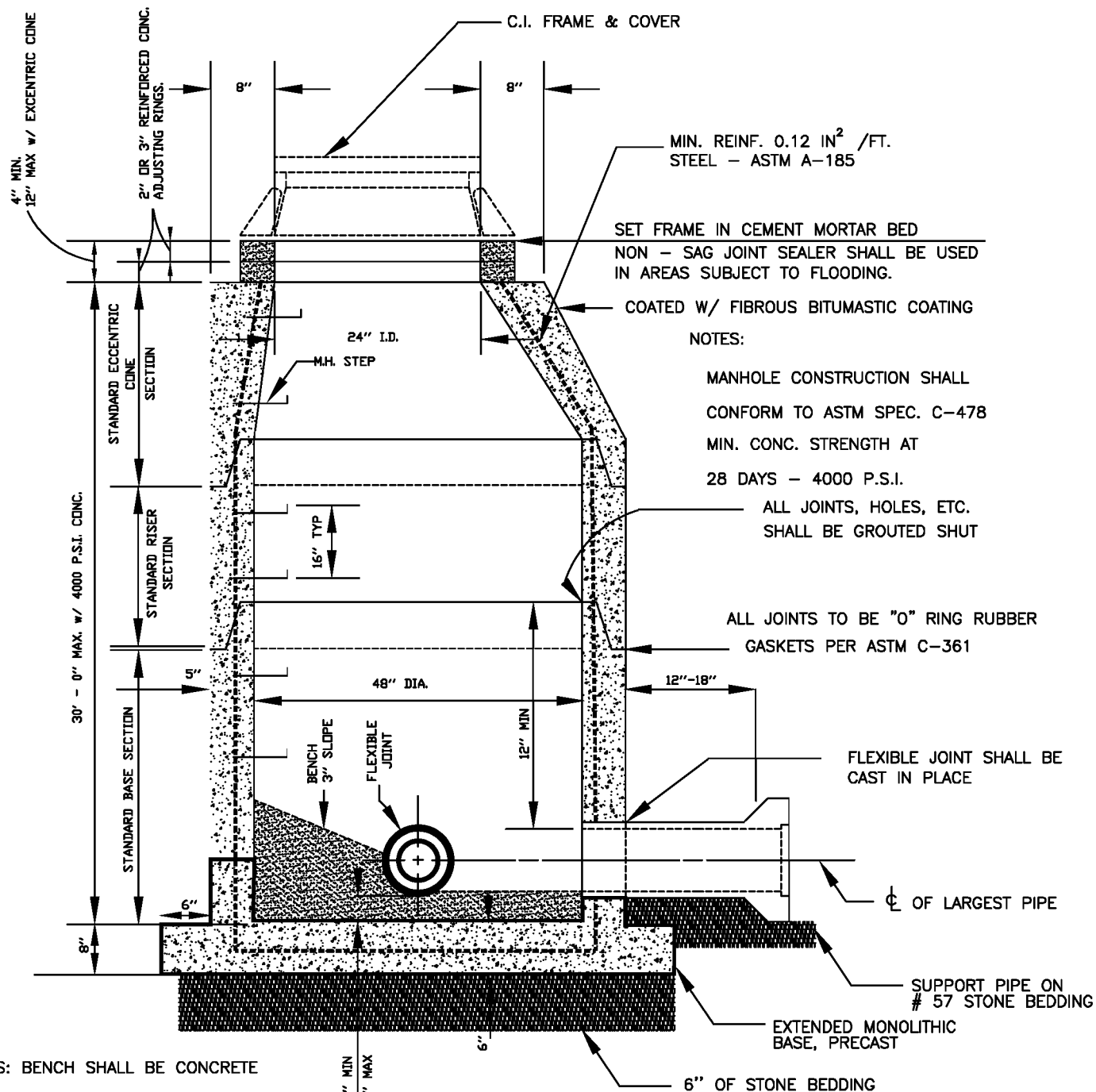
FITTING SIZE	VOLUME OF THRUST BLOCK IN CU.YD.			
	11-1/4°	22-1/2°	45°	90°
6"	-	-	-	1.3
8"	-	-	1.1	2.3
10"	-	-	1.8	3.7
12"	-	1.2	2.8	5.5
14"	0.5	1.7	3.9	7.6
16"	0.9	2.3	5.1	-
18"	1.4	3.2	6.3	-
20"	2.2	4.5	7.8	-

STANDARD
DETAIL NO.
WD-12

CONCRETE THRUST BLOCKING
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES



NOTES: BENCH SHALL BE CONCRETE
WHERE STUBS OR KNOCKOUTS ARE
PROVIDED FOR FUTURE CONNECTIONS
BENCH SHALL BE SO FORMED

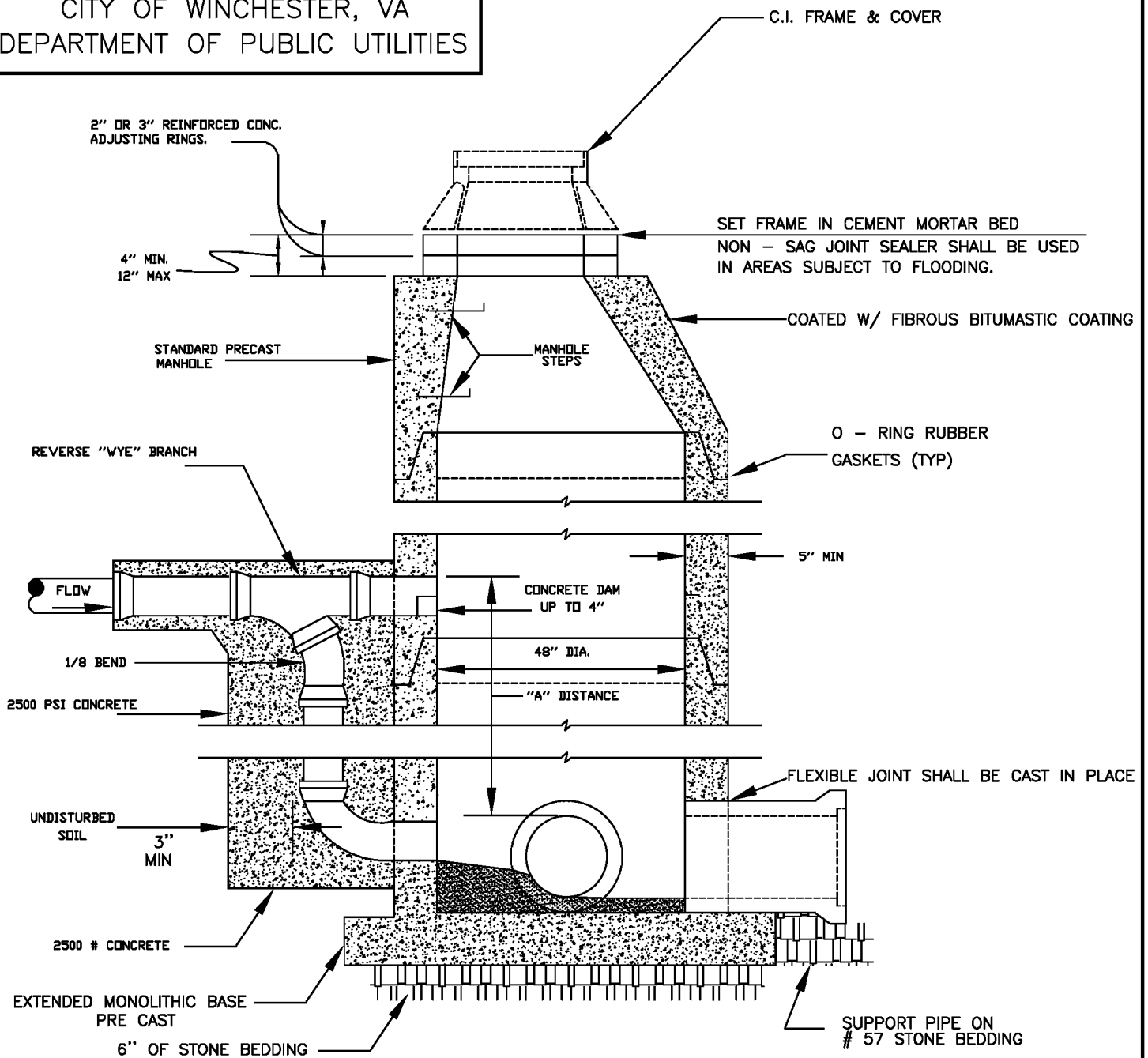
PRECAST CONCRETE BASE TO BE INTEGRAL WITH PRECAST RISER SECTION

STANDARD
DETAIL NO.
SS-1

STANDARD PRECAST CONCRETE MANHOLE
SEWER 8" TO 24"
SCALE: NONE

DATE: 12/03

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES



NOTES: WHERE "A" DISTANCE IS LESS THAN 6'-0" THE INCOMING SEWER SHALL BE LOWERED
SO THAT THE TOP OF THE INCOMING SEWER IS NOT MORE THAN 6in. ABOVE THE
TOP OF THE OUTGOING SEWER

WHERE "A" DISTANCE IS GREATER THAN 6'-0" USE STANDARD DROP CONNECTION.

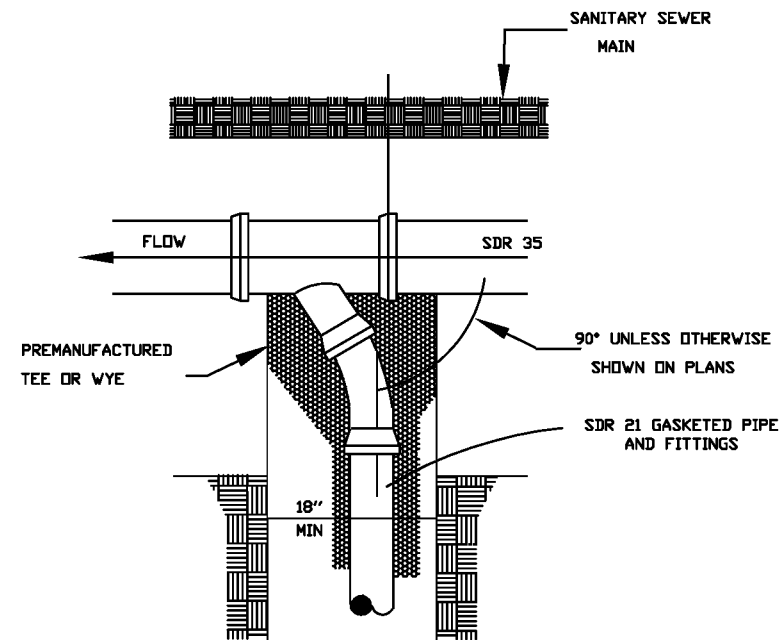
CONCRETE ENCASEMENT MAY BE ELIMINATED IF D.I. PIPE AND FITTINGS ARE USED
FOR DROP CONNECTION

STANDARD
DETAIL NO.
SS-2

DROP CONNECTION
SCALE: NONE

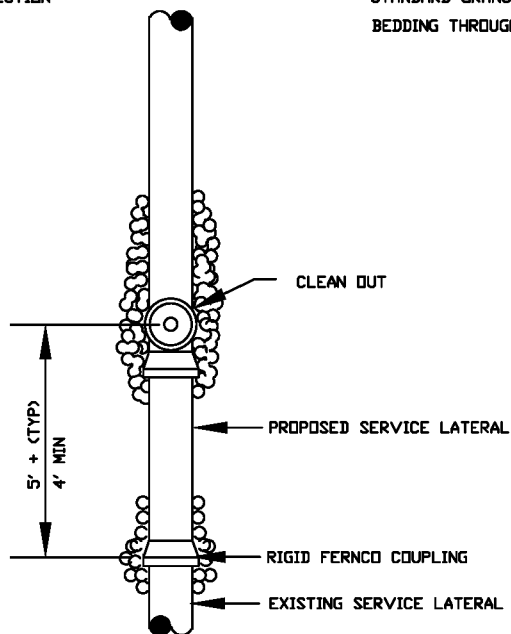
DATE: 12/03

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES



SEWER SERVICE CONNECTION
PER SPECIFICATIONS

STANDARD GRANULAR
BEDDING THROUGHOUT

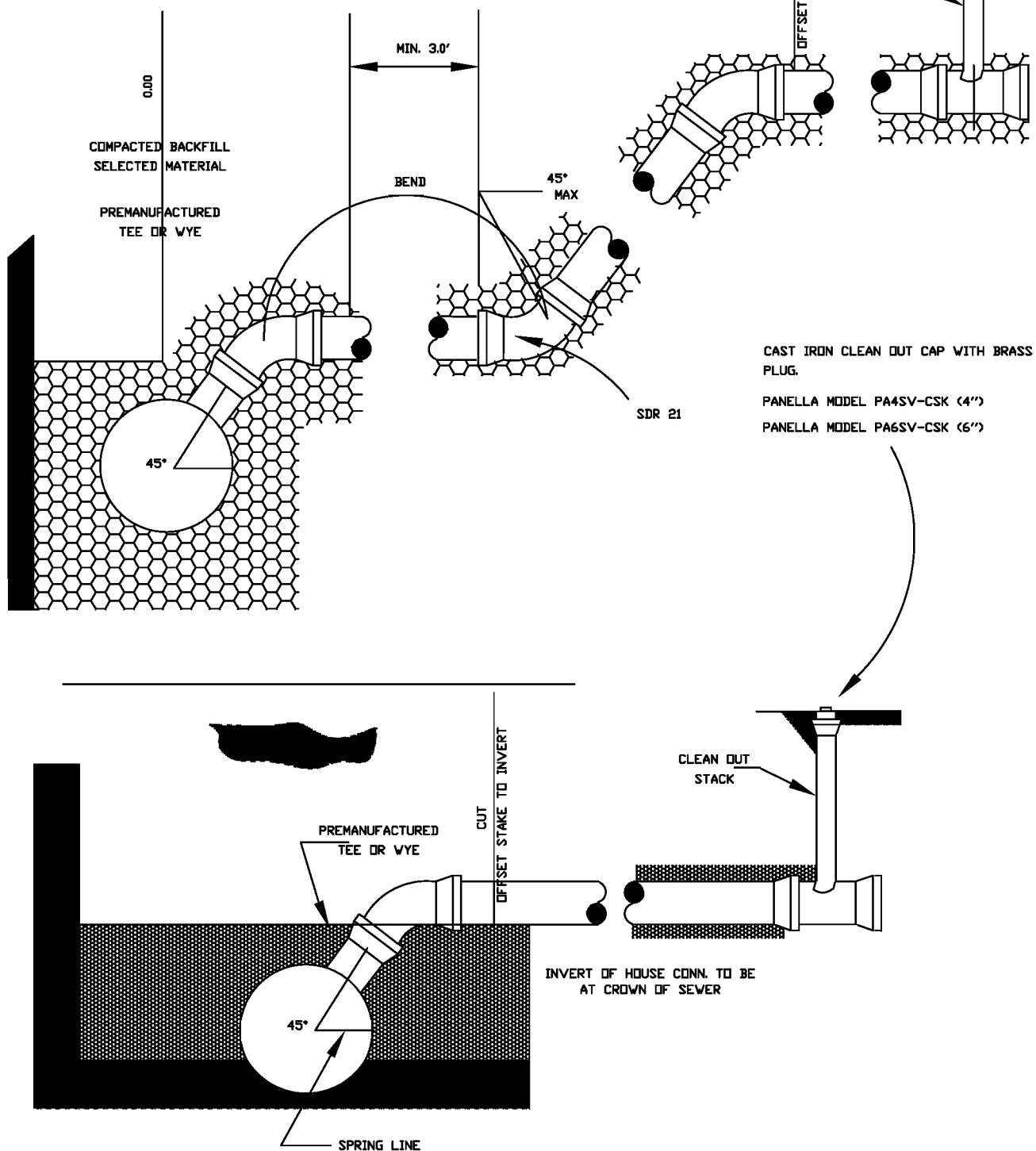


STANDARD
DETAIL NO.
SS- 3

STANDARD SANITARY
LATERAL CONNECTION
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES



STANDARD
DETAIL NO.
SS-4

STANDARD SANITARY
LATERAL CONNECTION
SCALE: NONE

DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

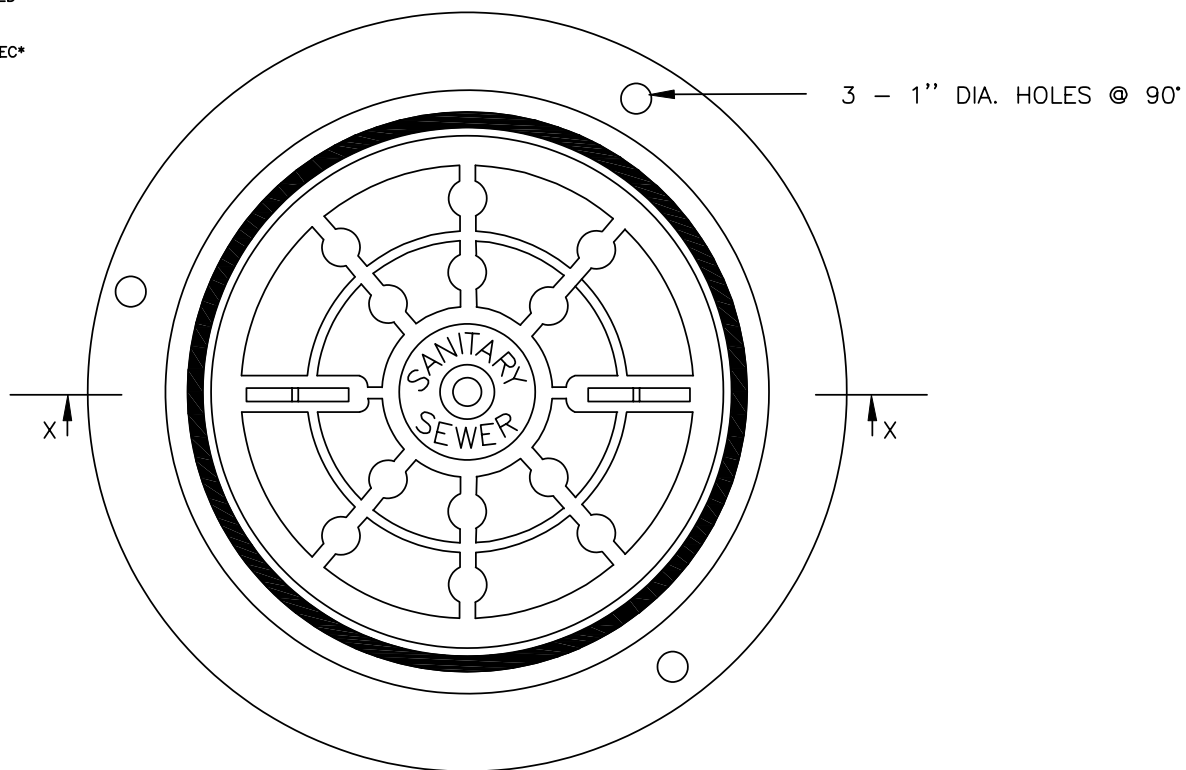
CAPITOL
FOUNDRY
OF VIRGINIA, INC

CAST IRON-ASTM A-48 CLASS-30B

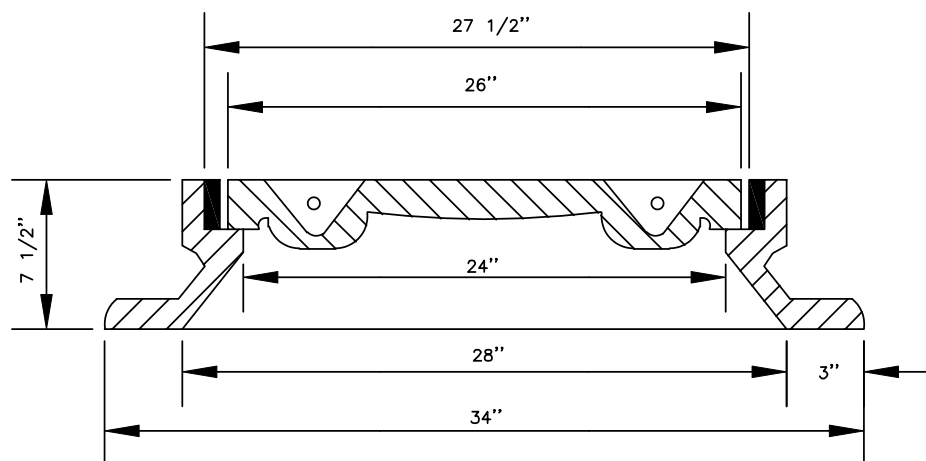
FINISH-ASPHALT COATED

ITEM NO : MH-3000 EC*

PATTERN NO : 1611



PLAN



SECTION- XX

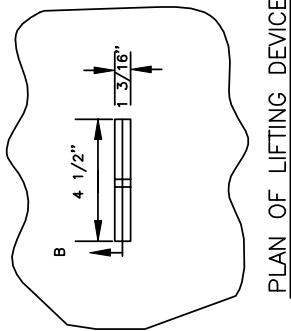
STANDARD
DETAIL NO.
SS-5

28" MANHOLE WITH PVC RING
SCALE: NONE

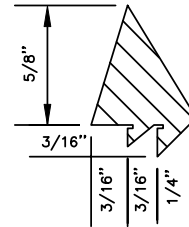
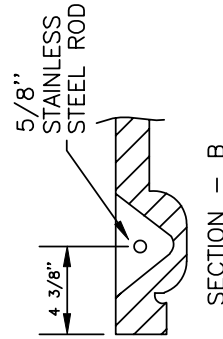
DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

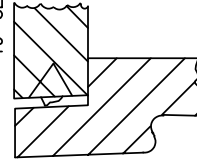
APITOL
FOUNDRY
OF VIRGINIA, INC



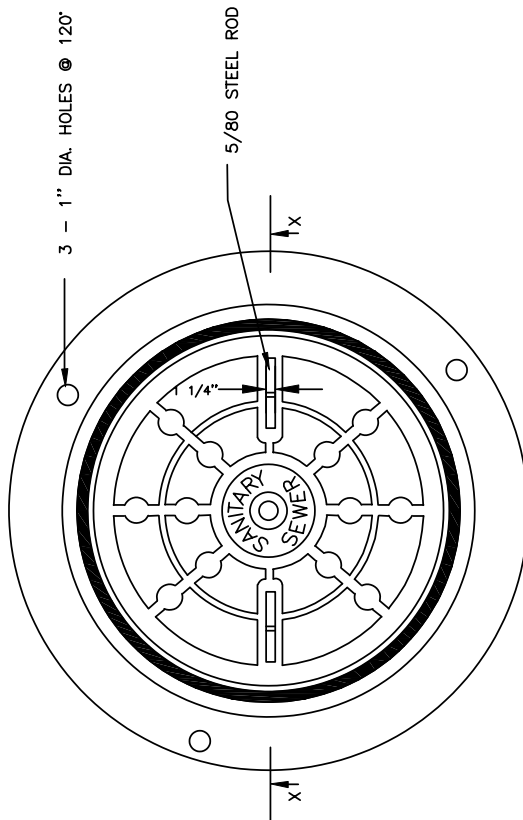
PLAN OF LIFTING DEVICE



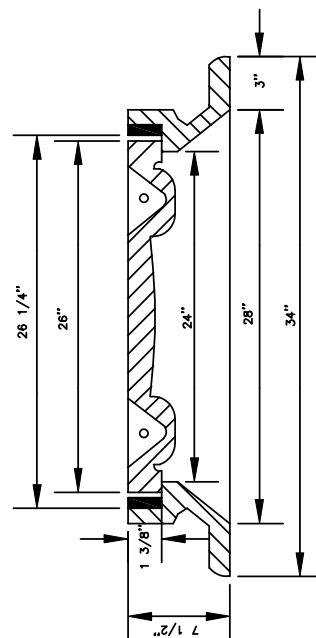
FRAME & COVER MACHINED
TO 10' LEVEL



WATER TIGHT DETAIL



PLAN



SECTION - XX

CAST IRON-ASTM A-48 CLASS-30B

FINISH-ASPHALT COATED

ITEM NO : MH-3000 EC*

PATTERN NO : 1593

STANDARD
DETAIL NO.
SS-6

28" WATERTIGHT MANHOLE
SCALE: NONE

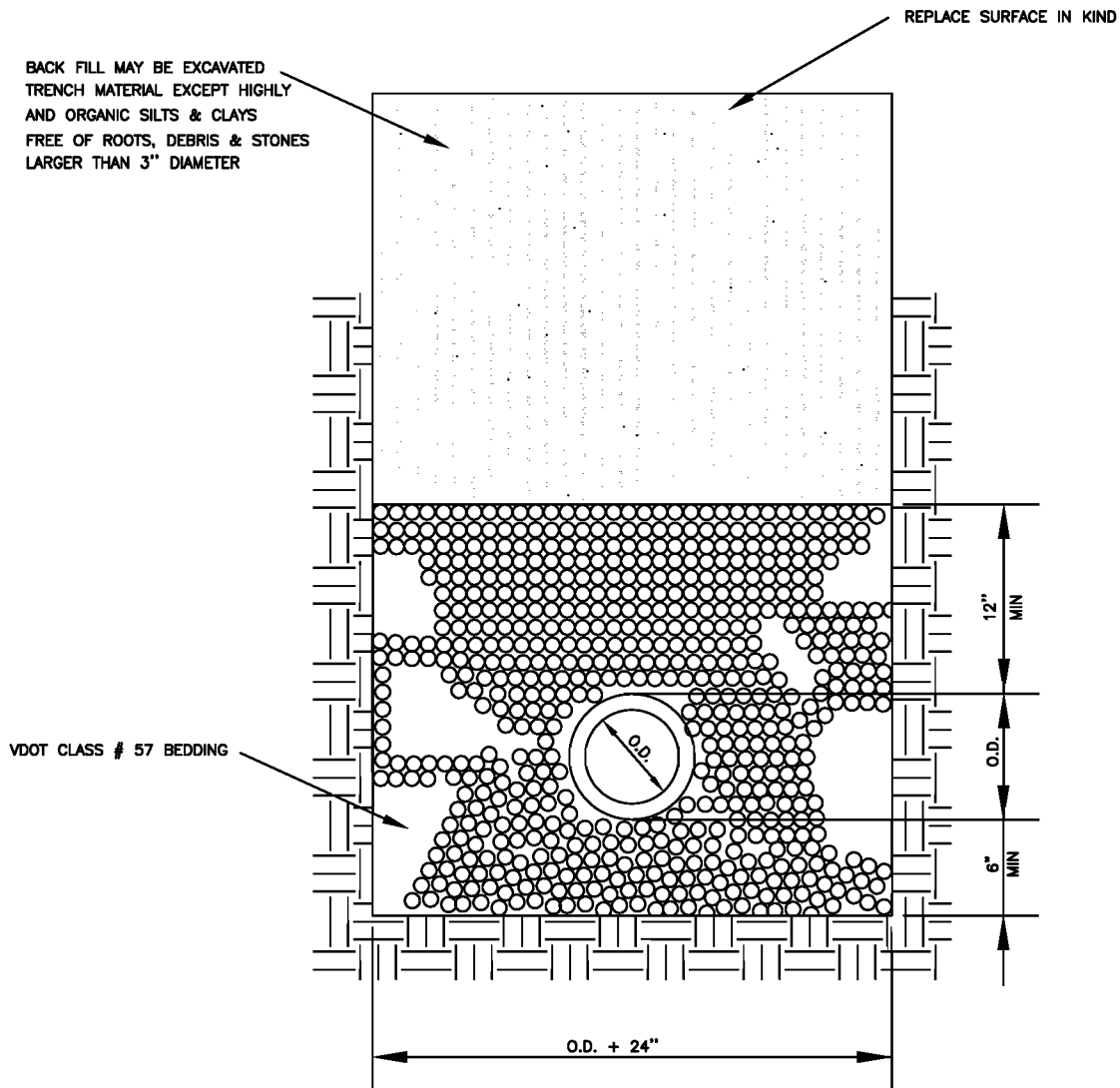
DATE: 9/01

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

* WHERE THE TRENCH BOTTOM IS ROCK, IT SHALL BE EXCAVATED TO A MINIMUM OF 8" BELOW THE BOTTOM OF THE PIPE AND BACKFILLED WITH BEDDING MATERIAL FREE OF ROOTS, DEBRIS & STONES

* WHERE SUBGRADE IS UNSTABLE, PIPE SHALL BE BEDDED ON A MINIMUM OF 8" BEDDING MATERIAL

* BACKFILL TO BE PLACED IN 12" LIFTS AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY



STANDARD
DETAIL NO.
WS - 1

STANDARD BEDDING DETAIL
OUTSIDE TRAFFIC AREAS (PVC OR DIP)
SCALE: NONE

DATE: 4/05

CITY OF WINCHESTER, VA
DEPARTMENT OF PUBLIC UTILITIES

* WHERE THE TRENCH BOTTOM IS ROCK, IT SHALL BE EXCAVATED TO A MINIMUM OF 8" BELOW THE BOTTOM OF THE PIPE AND BACKFILLED WITH BEDDING MATERIAL FREE OF ROOTS, DEBRIS & STONES

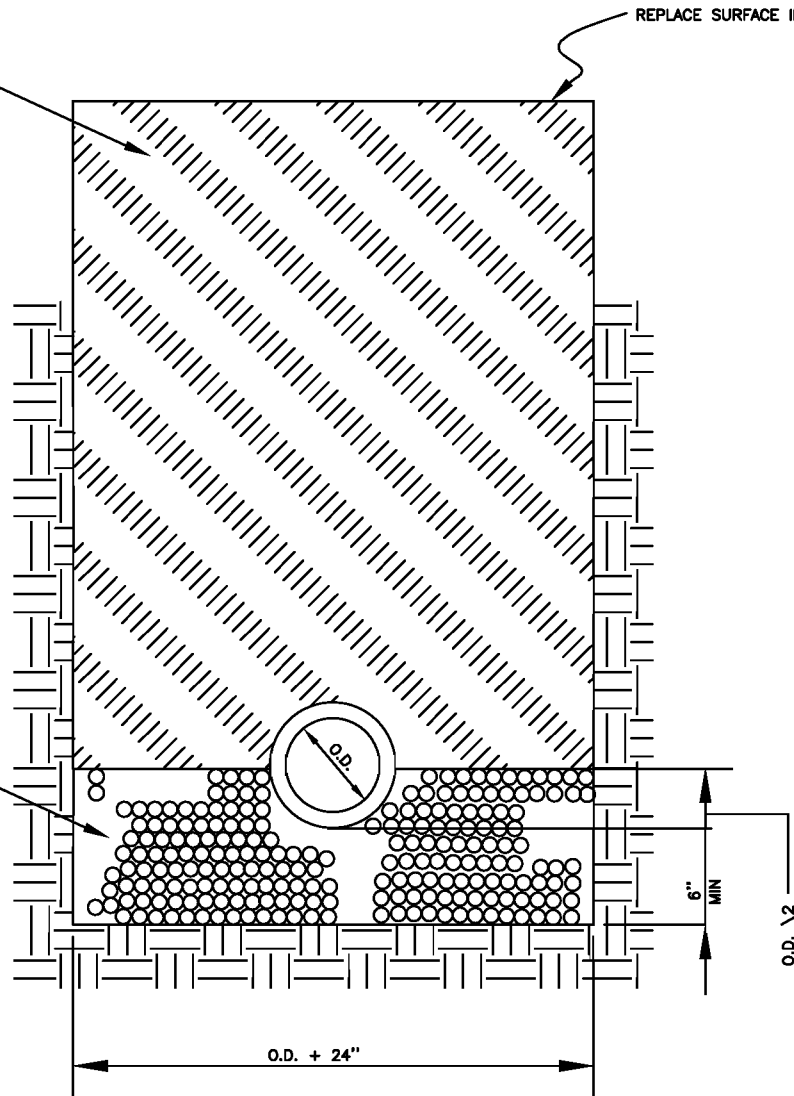
* WHERE SUBGRADE IS UNSTABLE, PIPE SHALL BE BEDDED ON A MINIMUM OF 8" BEDDING MATERIAL

* BACKFILL TO BE PLACED IN 12" LIFTS AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY

VDOT CLASS 21A BACKFILL. PLACE IN 6 INCH LIFTS, COMPACTED TO 95% OF MAXIMUM DRY DENSITY

VDOT CLASS # 57 BEDDING

REPLACE SURFACE IN KIND



STANDARD
DETAIL NO.
WS - 2

STANDARD BEDDING DETAIL
WITHIN TRAFFIC AREAS (PVC OR DIP)
SCALE: NONE

DATE: 4/05